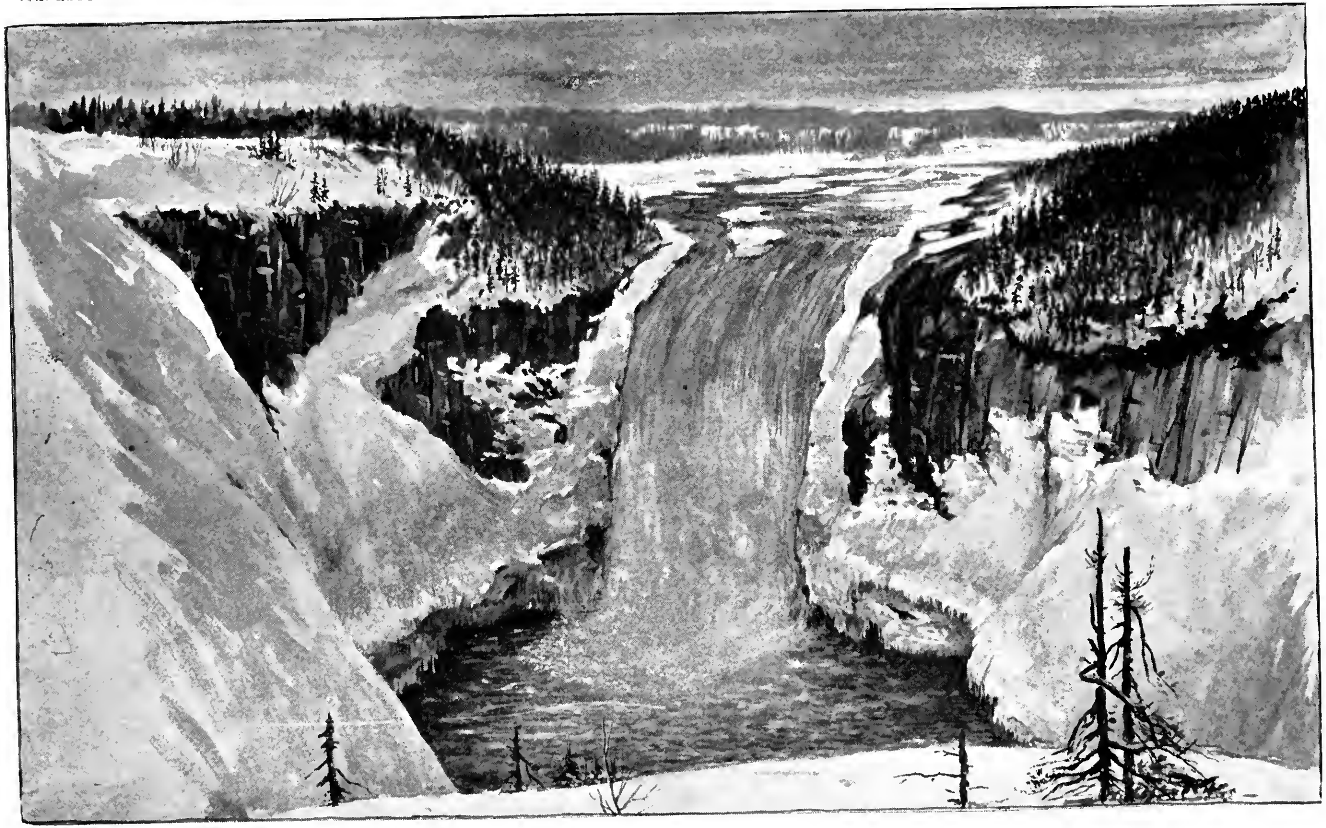

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GRAND OR McLEAN FALLS, HAMILTON RIVER.

GEOLOGICAL SURVEY OF CANADA
G. M. DAWSON, C.M.G., LL.D., F.R.S., Director

REPORT

ON EXPLORATIONS IN THE

LABRADOR PENINSULA

ALONG THE

EAST MAIN, KOKSOAK, HAMILTON, MANICUAGAN

AND

PORTIONS OF OTHER RIVERS

IN

1892-93-94-95

BY

A. P. LOW, B. Ap. Sc.

OTTAWA
PRINTED BY S. E. DAWSON, PRINTER TO THE QUEEN'S MOST
EXCELLENT MAJESTY
1896

To

George M. Dawson, C.M.G., LL.D., F.R.S.,
Director Geological Survey of Canada.

Sir,—I have the honour to submit herewith a report of my work in the Labrador Peninsula during the seasons 1892, 1893, 1894 and 1895.

I have the honour to be,

Sir,

Your obedient servant,

A. P. LOW.

NOTE.—All bearings mentioned in this Report refer to the true North. The magnetic variation at the mouth of the East Main River is 17° west and increases as the river is ascended till at Lake Nichicun it is nearly 30° west. From Nichicun to Fort Chimo the variation increases gradually to 45° west at the latter place. At the mouth of the Hamilton River the variation is 38° west, and along the river it ranges between 30° and 38° west, while along the Romaine River it is about 30° west, and at Lake Mistassini about 20° west.

REPORT

ON

EXPLORATIONS IN THE LABRADOR PENINSULA

ALONG THE

EAST MAIN, KOKSOAK, HAMILTON, MANICUAGAN AND PORTIONS OF OTHER RIVERS.

Introductory.

The present report is based mainly upon the observations made along the routes of exploration followed during the seasons of 1892, 1893, 1894 and 1895. The knowledge so gained has been supplemented by information obtained from officers and servants of the Hudson's Bay Company, Indians, and other persons acquainted with the Labrador Peninsula. Free use has also been made, in regard to certain subjects, of the information to be found in the writings of Mr. Lucius M. Turner,* Dr. A. S. Packard,† and Mr. W. A. Stearns,‡ who have all spent some time on the southern and eastern coasts and there collected much valuable information relating to the history, physical geography and natural history of those regions. Observations on the natural resources of the peninsula made by officers of the Geological Survey in former explorations, have also, when necessary, been incorporated in the text; a list of these explorations is given at the end of the historical notes. Sources of information.

Acknowledgments are due to Mr. C. C. Chipman, Commissioner of the Hudson's Bay Company, and to Mr. Peter McKenzie, for circular letters to the various officers in charge of posts along the routes travelled, and to the following gentlemen in charge of these posts: Messrs. J. Broughton, D. Mathewson, Wm. Scott, C. Sinclair, J. A. Wilson, A. Nicholson, H. M. S. Cotter, John Ford, J. Fraser, J. Gordon, W. Miller, J. Iserhoff and J. Corson, for their generous hospitality, valuable information and efficient aid, to which the success of the explorations has been largely due. Acknowledgment of assistance.

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* List of birds of Ungava, Proc. U. S. Nat. Museum, VIII., 1885.
Ethnology of Ungava, Annual Report U. S. Bureau of Ethnology, 1889-90.

† The Labrador Coast, New York, 1891.

‡ Labrador, Boston, 1884.

Work of assistants.

During the season of 1892, Mr. A. H. D. Ross, M.A., acted as my assistant and besides carrying out other varied duties, made a large collection of plants, which added greatly to the botanical knowledge of the eastern watershed. The names of these plants have been included in the list given in an appendix. In 1893, 1894, and 1895, Mr. D. I. V. Eaton, C.E., acted as assistant and topographer, and it is entirely to his careful work that the exact surveys of these years are due. Mr. Eaton, since his return to Ottawa, has also compiled the map which accompanies this report.

Previous reports.

Itineraries of the various journeys made in the course of these explorations have been printed in the Summary Reports of the Geological Survey Department for 1892, 1894, and 1895, and only a brief outline of the routes followed need in consequence be given here.

Route followed in 1892.

In 1892, the routes traversed were from Lake St. John, up the Chamouchouan River to its head, thence north-east through three large lakes to Lake Mistassini. From that lake the east channel of the Rupert River was descended some fifty miles, to a portage-route crossing through small lakes to the East Main River fifty miles northward. This stream was carefully surveyed downward for three hundred miles to its mouth on the east side of James Bay. James Bay was crossed to Moose River, and that stream ascended to its head, where the Canadian Pacific Railway was reached, making in all a canoe trip of over thirteen hundred miles. In 1893 and 1894, the party remained in the field during the winter. A start was again made from Lake St. John, and the chief branch of the Chamouchouan River was ascended to its head near Lake Mistassini. The same route as that followed the previous year, was taken to the East Main River, where the survey was commenced at the end of that year's work, and carried upward to the head of the river, where a crossing was made to the upper waters of the Big River, and that stream was descended to Lake Nichicun. A portage-route was then followed to Lake Kaniapiskau, and the Koksoak River, which flows out of it, was descended to its mouth at Ungava Bay. In this manner a canoe trip through the centre of the Labrador Peninsula from south to north was accomplished. From Fort Chimo, the Hudson's Bay Company's steamship "Eric" was taken to Rigolet on Hamilton Inlet. From Rigolet, canoes were taken to Northwest River, at the head of the inlet, where the early winter was passed. From the 19th January to the middle of May, the whole time was employed in hauling the outfit, canoes and provisions on sleds up the Hamilton River as far as the Grand Falls, some two hundred and fifty miles above the mouth of the river. The months of June and July were occupied in the

Route followed in 1893 and 1894.

exploration of the Ashuanipi branch of the Hamilton River to within a hundred miles of Lake Kaniapiskau, and with the exploration of Lake Michikamau. In August a start was made for the coast by ascending the Attikonak branch of the Hamilton River to its head, and thence crossing to the Romaine River. This stream was descended to within one hundred miles of the coast, whence a portage-route was followed to the St. John River, and by way of this river the Gulf of St. Lawrence was reached. The total mileage of travel for 1893-94 was 5460 miles, made up as follows:—In canoe, 2960 miles; on vessel, 1000 miles; with dog-teams, 500 miles; and on foot, 1000 miles.

Route followed in 1895.

The summer of 1895 was spent in exploring the Manicuagan River, flowing southward into the Gulf of St. Lawrence, which it enters about 240 miles below Quebec. This stream was geologically explored to the head of Mouchalagan Lake, where the surveys previously made by the Crown Lands Department of Quebec ended. Above this lake the main stream was surveyed, by micrometer, to its head in Summit Lake in latitude 53° N., and track-surveys were carried over portage-routes on various branches of this river and the head-waters of the Outardes River and of the Big River of Hudson Bay. In so doing a good idea was obtained of the country about the central watershed of the peninsula, as well as considerable additional information in regard to the geology and natural history of the region.

Arrangement of matter.

The subject matter of this report is separated into two parts.—The first contains a general summary of the observations made, and the conclusions reached from these. It is consequently more concise and readable than the other part, which consists of detailed descriptions of the routes, the rocks noted, and other observations for the use of future explorers in the regions traversed. In the part relating to the geology, a summary of the chief observations and deductions is given in connection with each formation, before the detailed observations are entered upon.

Appendices.

In the Appendices will be found lists and short notes on the mammals, birds, fishes and insects known to exist in the interior of the peninsula; also a complete list of plants of Labrador, compiled by Mr. J. M. Macoun, from the various collections made by members of the staff of the Geological Survey and others. A meteorological record for 1893-94 is also given in Appendix VII.

Previous Discoveries and Explorations.

Biarne.

The first European authentically known to have visited the eastern shores of America was Biarne, the Norseman, who, in 990, sailed south-east from Greenland, and skirting the shores of Labrador and Newfoundland, proceeded southward probably as far as Nova Scotia.

Leif. In 1000, Leif, the son of Eric the Red, the first settler in Greenland, followed Biarne's track and landed on the coast of Labrador, which, from its desolate rocky coast, he called Helluland, "Strong Land."

Latest Norse voyages. Following Lief came several expeditions of these hardy Norse navigators, who passed southward to "Vineland the good." The latest Norse voyage was in 1347, after which date knowledge of the American continent was lost for nearly one hundred and fifty years.

Szkolney. According to Humboldt, Szkolney, a Pole, is said to have made a voyage to Greenland and Labrador in 1476.

Basque fishermen. About this time, or shortly afterwards, the Basque fishermen, in search of whales, crossed the Atlantic to the shores of Labrador and Newfoundland, and appear to have been met there by the Cabots and Cortereal.

John Cabot. In 1497, John Cabot from Bristol, in search of a western passage to Cathay, sighted the coast of Labrador or Newfoundland. In the following year, his son, Sebastien Cabot, sailed from England and skirted the whole Labrador coast to beyond Cape Chidley, where he turned southward past Newfoundland, Nova Scotia and New England in hope of finding a passage to the eastward.

Cortereal. Cortereal, who sailed from Lisbon in 1500, reached Newfoundland, proceeded thence northward, and probably re-discovered Greenland.

Brest. In 1504, the town of Brest was founded by the French on Bradore Bay, near the Strait of Belle Isle. In 1517, fifty vessels called here, and in the height of its prosperity, about 1600, Brest contained two hundred houses and a population of about 1000 persons.

St. Lawrence. Denis, of Honfleur, and Aubert, of Dieppe, are said to have explored the St. Lawrence as far as the Saguenay in 1506 and 1508.

Labrador. A Portuguese map of 1520, has the name "Lavrador" applied to Greenland, while the unseparated coasts of Labrador and Newfoundland are called "Bacalhaos" or codfish in the Basque tongue. The name Labrador is derived from the Portuguese word for labourer, and was given to the coast because Cortereal brought home a cargo of natives as slaves.

Jacques Cartier. In 1535, Jacques Cartier explored the Gulf and River St. Lawrence as far as Hochelaga, and wintered at Quebec. The Saguenay River was examined by Roberval in 1543.

Mercator's map of 1569, shows the coast of Labrador and Ungava Bay, or Hudson Bay; and as his information was obtained from Portuguese sources, it is evident that the fishermen of that country had previously penetrated Hudson Strait. Mercator's map.

In 1577, Martin Frobisher sighted the northern coast of Labrador, in about latitude 58°, and thence sailed northward a short distance into Hudson Strait. Martin Frobisher.

The cod fishery of Labrador and Newfoundland had grown so rapidly that in 1578, 150 French, besides 200 vessels of other nations, were engaged in this industry, together with thirty Biscayan whalers. Fisheries.

In 1586, John Davis passed along the Labrador coast and discovered two openings, Davis Inlet, in latitude 56° N. and Ivutoke (Hamilton) Inlet in latitude 54° 30′ N. John Davis.

Hudson Strait was penetrated to Ungava Bay, or Hope's Advance, by Weymouth in 1602. Weymouth.

In 1603, Champlain established the first permanent settlement on the St. Lawrence, at Quebec, a small trading post having been built in 1600 at Tadoussac. Champlain.

Henry Hudson, in 1610, passed through the straits and wintered in the southern part of the bay which bears his name. The following spring he was cast adrift, off the east coast, by his mutinous crew. Henry Hudson.

In the following year, a ship was sent to his rescue under command of Sir Thomas Button, who entered Hudson Strait by a narrow channel south of Cape Chidley, crossed the bay, and wintered at the mouth of the Nelson River. Sir Thomas Button.

About the year 1630, the town of Brest and four leagues of coast on each side was granted to a noble named Courtemanche, who had married a daughter of Henry IV.; and the Eskimo, who had given the French much trouble, were expelled from the Gulf shores about the same time. Eskimo expelled from the Gulf of St. Lawrence.

The quest of the north-west passage brought out James and Fox, in 1631, to Hudson Bay, where James wintered on Charleton Island. James and Fox.

In 1641, the missionary, Jean de Quen, ascended the Saguenay and discovered Lake St. John.

The Sovereign Council of Quebec, in 1656, authorized Jean Bourdon to make discoveries in Hudson Bay. He proceeded there, took possession in the name of the French King, and made treaties of alliance with the Indians. Jean Bourdon.

In 1658, a lease of exclusive trading, hunting and fishing privileges was given by the King of France to Sieur Demaure. This lease Le Traité de Tadoussac.

was called "Le Traité de Tadoussac," and the territory to which it applied was called the King's Domain. It extended along the St. Lawrence from Isle aux Coudres to a point two leagues below Seven Islands, and included the country northward to the heads of the rivers draining into the St. Lawrence. The trading stations established in this territory were called "Postes du Roi," or King's Posts. The lease passed to the "Compagnie des Postes du Roi," and was renewed every twenty-one years. After the cession of Canada, the lease was continued in the same manner by the English government. When it was renewed by the Hudson's Bay Company, in June, 1842, for another term of twenty-one years, the Crown reserved the right to subdivide the country into townships for purposes of settlement. The Hudson's Bay Company's lease was ended by limitation in 1859.

Père Dablon.

In 1661, Père Dablon, a Jesuit, and Sieur de Vallière were ordered by d'Argenson, at that time Governor of Canada, to proceed to the country about Hudson Bay. They went there apparently by way of the Saguenay and Rupert rivers. Subsequently, the French company, in their dispute with the Hudson's Bay Company, claimed that they had at that time erected a small post at the mouth of the Rupert River for trade with the Indians, who had asked at Quebec that a missionary and traders be sent among them.

Sieur de la Couture.

In 1663, the Indians from about Hudson Bay again returned to Quebec to renew their former request for traders, and Sieur de la Couture, with five men, proceeded overland to the bay, took possession in the King's name, noted the latitude, planted a cross and deposited His Majesty's arms, engraved on copper, at the foot of a large tree. In the same year, Sieur Duquet and Jean L'Anglois also visited the bay, and set up the King's arms by orders of d'Argenson.

Radisson and Chouart.

In 1667, Radisson and Chouart *dit* Groseilliers ascended to Lake Superior, and thence crossed to Hudson Bay. They returned to Quebec, and proposed to the merchants to conduct ships to Hudson Bay, but, their proposal being rejected, they went to Paris, where they met with no better success. From Paris they were sent by the British ambassador to London, where their proposal was well received by certain merchants. In 1668, a small vessel was fitted out under command of Zachray Gilham, who, accompanied by the two Frenchmen, sailed to the southern part of the bay, and wintered in a small building called Fort Charles, at the mouth of the Nemiskaw, or Rupert River.

Hudson's Bay Company.

In 1669, on the return of Gilham to London, Prince Rupert and others applied to King Charles II. for a charter, which was granted them under the title of the "Governor and Company of Adventurers Trading from England to Hudson's Bay."

In the following year, the company sent out Chas. Bayly to establish a post at Rupert River. He was accompanied by Chouart and Radisson, and remained in the country, thus inaugurating the first permanent English settlement on Hudson Bay.

First settlement on Hudson Bay.

In 1674, Charles Albanel, a Jesuit missionary, arrived at the English settlement with letters from the Governor of Quebec, who had despatched him in 1672, overland from Quebec, to see what the English were doing on the bay. The route followed by Albanel was up the Saguenay River to Lake St. John, thence by the Chamouchouan River to the height-of-land and Lake Mistassini, and down the Rupert River to its mouth. An account of his trip is given in the Relations of the Jesuits, and is the first description of this portion of the country.

Père Albanel.

In 1675, outposts were established at Moose and Albany, and a depot on Charleton Island, where the ship from England discharged her cargo and took on board the furs from the various posts, brought there in sloops.

Establishment of Moose and Albany.

By 1685, the company had forts at Albany, Moose, Rupert, Nelson and Severn; also a small post on the East Main, or "Ison-glass River," where a mica mine was worked, but was soon abandoned as unprofitable.

In March, 1686, the directors of the French Company, on representation of the harm done to their trade by the English on the bay, obtained from M. de Denonville a body of Canadian and regular troops, under the command of M. de Troye. They were sent overland, reaching Hudson Bay in June, and captured Forts Rupert, Moose and Albany. This was the beginning of a desultory warfare, carried on with varying success, between the French and English for a number of years, until the Treaty of Ryswick in 1697. The seventh clause of the treaty restored to each belligerent the possessions held previous to this war. The eighth clause appointed commissioners to examine and determine the rights of either of the kings to places in Hudson Bay; "but the possession of those places which were taken by the French during the peace that preceded the present one, shall be left to the French by virtue of the foregoing article." In consequence, the only post left to the Hudson's Bay Company was the fort at Albany.

Warfare between French and English at Hudson Bay.

In 1700, the Hudson's Bay Company addressed a communication to the Lords of Trade in reference to their boundaries. They proposed the Albany River, or the 53rd parallel of north latitude, as the boundary on the west coast of the bay, and the Rupert River as the boundary on the east coast. The French were ready to accept the

Boundary claimed by Hudson's Bay Company.

55th parallel of north latitude, but this the company refused to agree to. In answer to the Lords of Trade, in 1701, the company made the further offer as to the limits between themselves and the French:—
"2. That the French be limited not to trade by wood-runners or otherwise, nor build any house, factory or fort, to the northward of Hudson's River, on the east main or coast."

Treaty of Utrecht.

Matters remained unsettled until the Treaty of Utrecht in 1713, when the French ceded all their rights to Hudson Bay to the English.

Boundary claimed by Hudson's Bay Company.

In 1712, the company in a memorial to the Lords of Trade, and later in 1714, proposed for a settlement of the boundary between their territory and the French, "That the said limits begin from the island called Grimmington's Island or Cape Perdrix (Cape Mugford) in the latitude of 58½ degrees north, which they desire may be the boundary between the English and the French on the coast of Labrador, towards Rupert's Land on the east main, and Nova Britannia on the French side."—"That a line supposed to pass to the southwestward of the said island of Grimmington or Cape Perdrix to the great Lake Miskosinke at Mistoveny, dividing the same into two parts as in the map now delivered"—"and from the said lake to run southward unto 49 degrees north latitude."

Delisle's map.

The map made by Delisle in 1703, shows the knowledge possessed by the French at the time of the Treaty of Utrecht of the interior of the Labrador Peninsula. On it is marked Lake Mistassini, discharging into James Bay, and also into Lake St. John. Pletipi, Manicuagan and Nichicun lakes are in their respective places, but the last is made to drain through Lake Pletipi into the Outardes River. At the head of the Peribonka River, there is a large lake named Outakouami, which discharges also into the East Main River, and a large stream flowing northward with the following note:—"R. que les sauvages disent tomber dans la mer du nord après 60 lieues de cours;" and the bay is shown in part near latitude 55°, with a break between it and "Bay du Sud" (Ungava), which extends southward between latitudes 61° and 57°. Hamilton Inlet is marked by a long narrow bay, without any large rivers at its head. The country northward of the East Main River and the eastern part of the southern watershed appear to have been unknown. Indefinite and rough as the topography of this map is, still it is greatly in advance of the English maps published about this time, which show only Lake Mistassini and the Rupert and East Main rivers in the interior of the Labrador Peninsula.

From the Treaty of Utrecht until after the cession of Canada, the Hudson's Bay Company appears to have confined its trade and investigations on the east side of the bay wholly to the coast. In 1732, a small post was re-established at the mouth of the East Main River, which was shortly afterwards made the headquarters of the east coast, and continued as such until after 1820, when two districts were established on this side of the bay, with headquarters at Rupert and Great Whale rivers. About the time of the re-establishment of East Main, a post was opened on Richmond Gulf for trade with the Eskimo, but was soon abandoned, after two massacres by the natives.

Hudson's Bay Company.

An ordinance respecting the limits of the King's Domain, issued at Quebec in 1733, makes mention of the posts of Tadoussac, Chekoutimy, Lac St. Jean, Nikaubau, Mistassinoe, Papinachois, Naskapis, River Moisie and Seven Islands, showing that the lessees were well established throughout that territory. No records are obtainable of the other districts, seigniories, and fur leases granted at Quebec, but the above may be taken as an example of the manner in which the French traders had penetrated and established posts throughout the interior of the Indian country, many years previous to the English occupation of Canada. The traders and "coureurs des bois" must have travelled far into the interior of the Labrador Peninsula, where they lived the greater part of the time with and like the Indians, only returning to Quebec for a short time every two or three years. Much of the information obtained by these men was never recorded and is consequently lost, while the little that was written is very difficult of access.

Trading posts in the King's Domain.

In 1732, Joseph Normandin was sent by the governor to explore and survey the region about Lake St. John. He ascended the Chamouchouan River to Lake Nikaubau, and mentions Peltier post as well as one on Ashouapmouchouan Lake, which was first established in 1690.

Joseph Normandin.

Shortly after the conquest of Canada, the North-west Company was formed, and appears to have acquired, among others, the lease of the "King's Domain." Under its vigorous management, the fur trade in the North-west and Canada rapidly increased, and this company soon became antagonistic to the Hudson's Bay Company, which now began the establishment of inland posts. The first of these, inland on the east side of Hudson Bay, probably dates from this period; it was situated on the East Main River, about three hundred miles above its mouth, at Birch Point, where a portage-route leads southward to Lake

North-west Company.

Post inland on the East Main River.

Mistassini. Subsequently, and before the amalgamation of the Hudson's Bay and North-west companies, this post was removed to the outlet of Lake Mistassini, and again to its present position on the south-west bay, where the North-west Company also had a post on a long narrow point, a few miles to the southward. This appears to have been the only inland post of the Hudson's Bay Company established in Labrador prior to the amalgamation of the companies in 1821.

Labrador Company.

Shortly after the conquest of Canada, the town of Brest, and one hundred and fifty miles of the north shore of the Gulf of St. Lawrence to the westward of that place. was granted to the Labrador Company of Quebec, with exclusive rights to the fisheries and fur trade. In this manner the entire north shore of the gulf was closed to private enterprise, and long remained so, as the coast to the westward of the Labrador Company's concessions was held by the seigniors of Mingan, whose grant extended to the eastern limit of the King's Domain.

Labrador Coast under jurisdiction of Newfoundland.

In 1763, the southern and eastern coasts of Labrador were placed under the jurisdiction of the Governor of Newfoundland; and the eastern and northern boundaries of the province of Canada were defined by the St. John River to its head, and from there by a line drawn through Lake St. John to Lake Nipissing.

Moravian Missionaries.

In 1770, the Moravian missionaries first settled among the Eskimo on the Atlantic coast.

Major Cartwright.

About the same time Major Cartwright made settlements at Cape Charles and Sandwich Bay, bringing with him a number of people from Dartmouth, for the salmon fisheries and trade with the Eskimo and Indians.

Labrador Coast.

In 1773, the coast of Labrador was restored to the jurisdiction of the Governor of Canada, on account of disputes between Newfoundland and the Labrador Company.

Hamilton Inlet.

In 1777, the first English entered Hamilton Inlet for purposes of trade with the natives, and found there the remains of posts erected by the French prior to the secession. The first posts were established on the inlet, by a Quebec Company, in 1785.

André Michaud.

André Michaud the celebrated French botanist, in 1782 passed through Lake St, John and reached Lake Mistassini. He had intended to descend the Rupert River to James Bay, but was obliged to return from Lake Mistassini, on account of the lateness of the season.

Labrador again attached to Newfoundland.

In 1809, the eastern coast of Labrador was again attached to the Government of Newfoundland, but the area of coast was reduced, and extended only from Anse Sablon northward to Hudson Strait.

In 1811, the Moravian missionaries Kollmeister and Kmoch, explored the northern Atlantic Coast and Ungava Bay, and reported favourably on the climate and soil of the latter place. Kollmeister and Kmoch.

The Labrador Company was dissolved in 1820, and that part of the Gulf shore previously under its control was thrown open to settlement and private fisheries. Labrador Company.

After the amalgamation of the Hudson's Bay and North-west companies in 1821, the policy of the former appears to have changed; and the country to the east of Hudson Bay was shortly after explored, posts being established throughout the interior of the peninsula. Explorations East of Hudson Bay.

In 1814, the Rev. Mr. Steinhaur published in the Transactions of the Geological Society a short description of the Atlantic coast, together with notes on the various rocks found about the Moravian mission stations. Rev. Mr. Steinhaur.

Between 1821 and 1824, James Clouston was employed in exploring the country east of Hudson Bay. There are no available notes or records of his travels, and all that remains is a map on a small scale, showing the routes that he followed. These embrace the East Main River to the Tichagami Branch, a few miles beyond the old post of Birch Point, two portage-routes between the East Main and Rupert rivers, the Rupert River and Lake Mistassini, and the routes to Waswanipi on the Nottaway River. The original map is at Great Whale River post, where a tracing of it was made in 1888, which is now in the Geological Survey office. James Clouston's explorations.

In 1824, a party was fitted out at Moose Factory to proceed overland to Ungava Bay and there establish a post; but it was not until three years later that this was accomplished by Dr. Mendry, who coasted along the east shore to Richmond Gulf, and then passed inland to Clearwater and Seal lakes, thus reaching the head-waters of the Larch Branch of the Koksoak River, which was descended to near its mouth, and Fort Chimo there first established. This trip is the basis of Ballantyne's "Ungava" a popular story for boys. A map made of the route by Dr. Mendry, is at present at Moose Factory, and a tracing of it is in the Geological Survey office; the part between Clearwater Lake and the forks of the Larch River has been used, in the compilation of the map accompanying this report. Establishment of Fort Chimo.

In 1824, the Governor of Newfoundland was empowered to institute a court of civil jurisdiction along the coast of Labrador.

Between 1827 and 1829, Admiral Bayfield made charts of the Atlantic and St. Lawrence coasts for the British Admiralty. Admiral Bayfield.

In 1827, the first survey of Lake St. John was made for the Quebec Government by Larue.

John McLean.

In January and February of 1838, John McLean, then in charge at Fort Chimo, crossed overland to Hamilton Inlet, where the Hudson's Bay Company had established posts in 1837, passing on the way through Lake Michikamau. He retraced the route and reached Fort Chimo again on the 20th April. The same year a post was established at Erlandson's Lake, which appears to have been situated on the headwaters of the Whale River. Another outpost was also established on the George River.

Discovery of the Grand Falls, Hamilton River.

In 1839, McLean again started across to Hamilton Inlet with canoes, but reached only the Grand Falls of the Hamilton River, and thus had the honour of being the first white man to view this mighty cataract. Not having a knowledge of the portage-route past the falls, he was obliged to return without reaching his destination. In the following summer he was more successful, and reached Hamilton Inlet with canoes, as he also did in the two following years. An interesting account of McLean's trips and also much information concerning the country, is given by him in his book entitled "Twenty-five years in the Hudson's Bay Territory."

Fort Nascaupee.

In 1840, Fort Nascaupee was established on Lake Petitsikapau, drawing its supplies from Hamilton Inlet, and the post of Erlandson's Lake was then abandoned. This was followed in 1853 by the temporary withdrawal of the Hudson's Bay Company from Fort Chimo and other posts belonging to it.

Map of the interior of Labrador Peninsula.

In 1842, John Beads and John Spenser, at Nichicun and Lake Kaniapiskau, compiled a map of the region surrounding these place giving the various branches and lakes of the rivers draining southward, westward and northward, from the central portion of the peninsula. This map was found at Nichicun in 1893, and is now in the Geological Survey office. It has been used largely in the compilation of the unsurveyed parts of the map accompanying this report.

List of trading posts.

In his evidence before the select committee of the House of Commons on the Hudson Bay's Company, 1857, Sir George Simpson made a return of the various posts and number of Indians attached to each, throughout the territories of the company. The following list shows the posts then situated in the Labrador Peninsula:—Chicoutimi, Tadoussac, Isle Jeremie, Godbout, Seven Islands, Mingan, Musquarro, Natasquan, Northwest River, Rigolet, Kibokok, Great Whale River, Little Whale River, Fort George and Rupert House, all located on the coast, and Mistassini, Temiskami, Waswanipi, Mechiskan, Pike

Lake, Lake St. John, Nichicun, Kaniapiskau and Fort Nascaupee in the interior.

In 1860, A. F. Blaiklock surveyed the Mistassini and Chamouchouan rivers flowing into Lake St. John. Since that date, under the direction of the Quebec Department of Crown Lands, all the principal rivers of the southern watershed have been carefully surveyed to near their sources; and but little work remains to be done to complete the map of the rivers of this slope.

A. F. Blaiklock.

Surveys by Quebec Crown Lands Department.

The same year an expedition was sent by the United States Government, and a station was established on the Atlantic coast in latitude 59° 54′, to observe a solar eclipse. In the report of the United States Coast Survey, 1860, a short account of the voyage, with notes on the climate, together with a chart of Eclipse Harbour is given by Commander Alexander Murray; and notes on the geology of the northern coast of Labrador by Oscar M. Leiber.

United States Coast Survey Eclipse Station.

In 1862, Henry Yule Hind ascended the Moisie River about 150 miles; and wrote two volumes on his experiences and information gathered from Indians and other sources relating to the interior of Labrador. This book is still quoted as the standard authority on the Labrador Peninsula.

Henry Yule Hind.

In 1860 and 1864, Dr. A. S. Packard visited the Atlantic coast, and besides various earlier papers on the fauna and flora, published in 1891, a work entitled "On the Labrador Coast," which deals very fully with the history and natural resources of the Atlantic coast, and is a valuable addition to the bibliography of Labrador.

A. S. Packard.

In 1866, the Hudson's Bay Company again established Fort Chimo, and shortly afterwards opened posts at George and Whale rivers, where extensive salmon and porpoise fisheries are still carried on, besides trade with the natives.

Fort Chimo re-established.

Between 1866 and 1870, Père Babel, O.M.I., travelled inland from Mingan, and lived with the Indians, exploring with them both branches of the Hamilton River, and the headwaters of many of the streams of the southern slope. A map made during his wanderings, is kept at the mission station of Betsiamites, and when consideration is taken of his imperfect instruments and other disadvantages, its accuracy is wonderful.

Père Babel.

About 1875, the Roman Catholic missionaries visited and established a mission for the Indians at Northwest River; and during the two following summers, Père Lacasse crossed overland from that place to Fort Chimo, returning in the Hudson's Bay Company's vessel.

Roman Catholic missionaries.

Moravian missionaries.

In 1873, the Moravian missionaries published two maps of the Atlantic coast; the northern sheet extending northward from latitude 57°, the southern sheet embracing the coast from Hopedale to Sandwich Bay.

Abandonment of interior trading posts.

With the establishment of posts on Ungava Bay, the Hudson's Bay Company abandoned their interior posts on the Hamilton River, and at Lake Michikamau. Fort Nascaupee and Michikamau were closed in 1873, and the post at the head of Lake Winokapau in 1874. The closing of these posts now leaves only Nichicun, Mistassini and Waswanipi in the interior of the peninsula.

Jurisdiction of Newfoundland.

In 1876, the extent of the jurisdiction of the Government of Newfoundland in Labrador, was defined in Letters Patent constituting the office of Governor and Commander-in-Chief of the Island of Newfoundland. "All the coast of Labrador, from the entrance of Hudson Straits to a line to be drawn due north and south from Anse Sablon on the said coast to the fifty-second degree of north latitude, and all the islands adjacent to that part of the said coast of Labrador."

Hudson Strait exploration.

In 1884 and 1885, the Dominion Government sent a vessel to Hudson Strait, to establish observation stations on both sides, in order to obtain reliable information concerning the amount and movements of the ice.

Rev. Mr. Peck.

In 1885, the Rev. Mr. Peck, of the Church Mission Society, crossed from Richmond Gulf to Ungava Bay, following the route previously taken by Dr. Mendry.

Lucien M. Turner.

During 1885 and 1886 Mr. L. M. Turner was engaged collecting birds and mammals, and doing other scientific work in the vicinity of Fort Chimo for the Smithsonian Institution at Washington.

R. F. Holmes.

In 1887, Mr. R. F. Holmes attempted to reach the Grand Falls of the Hamilton River from its mouth, but, being handicapped with a heavy boat and a poor crew, reached only Lake Winokapau. He made an excellent map of the river to that point, and wrote an account of his trip, which appeared in the Transactions of the Royal Geographical Society.

Expeditions up Hamilton River.

In 1891, two separate expeditions from the United States ascended the Hamilton River, and visited the Grand Falls within a few days of each other. Messrs. Austin Cary and D. M. Cole * who were the first to reach the falls, had the misfortune to burn their boat and outfit, and were obliged to tramp to the mouth of the river, two hundred and

* Bulletin American Geog. Soc., vol. xxiv., p. 1.

fifty miles distant from where the mishap took place. This they very pluckily accomplished, passing unseen Messrs. Henry G. Bryant * and C. A. Kenaston, who were on their way up the river at the time.

Explorations by the staff of the Geological Survey.

The following is a list of the reports relating to the Labrador Peninsula published by the Geological Survey of Canada, from explorations made by members of the staff:—

Report, 1853-56.—On the Island of Anticosti, and the Mingan Islands.—J. Richardson.
Report, 1857.—On part of the Gaspé Peninsula from Magdalen River to Gaspé Bay, and on Lake St. John.—J. Richardson.
—On the Fauna of portions of the Lower St. Lawrence, the Saguenay, Lake St. John, etc.—R. Bell.
Report, 1866-69.—On the north shore of the Lower St. Lawrence.—J. Richardson.
Report, 1870-71.—On the geology of the country north of Lake St. John.—J. Richardson.
Report, 1871-72.—On exploration of Country between Lake St. John and Lake Mistassini.—W. McOuatt.
Report, 1877-78.—Report on an Exploration of the East Coast of Hudson Bay.—R. Bell.
Report, 1879-80.—Report on Hudson Bay and some of the Lakes and Rivers lying to the west of it.—R. Bell.
Report, 1882-83-84.—Observations on the Coast of Labrador and on Hudson Strait and Bay.—R. Bell.
Report, 1885.—Report of the Mistassini Expedition.—A. P. Low.
" —Observations on the Geology, Zoology and Botany of Hudson Strait and Bay.—R. Bell.
Report, 1887-88.—Report on Explorations in James Bay and the Country east of Hudson Bay, drained by the Big, Great Whale and Clearwater Rivers.—A. P. Low.

Physical Geography.

Boundaries of the Labrador Peninsula.

The eastern coast of the Labrador Peninsula extends north-northwest, from the Strait of Belle Isle to Cape Chidley, a distance of about seven hundred miles, or from latitude 52° to latitude 60° 30′, fronting the North Atlantic. The northern boundary from Cape Chidley to Cape Wolstenholme, at the entrance of Hudson Bay, in a straight line, is nearly five hundred miles long, and runs about west-north-west in direction, forming the southern shore of Hudson Strait including Ungava Bay. A line drawn from Cape Wolstenholme to the bottom of James Bay, runs nearly north-and-south for eight hundred miles, and corresponds closely to the eastern shore-line of the peninsula. The southern boundary is arbitrary but has been taken as a straight line extending in a direction nearly east from the south end of James Bay near latitude 51°, to the Gulf of St. Lawrence near Seven Islands in latitude 50°. This line is nearly six hundred miles long, and passes close to the south end of Lake Mistassini. From where the line reaches the Gulf coast, in the neighbourhood of Seven Islands, the shore-line forms the southern boundary to the Strait of Belle Isle, with a length of somewhat over five hundred miles.

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* A Journey to the Grand Falls of Labrador, Geog. Club, Philadelphia.

Extent.

The total area embraced within these boundaries is approximately 511,000 square miles, of which, previous to the present explorations, 289,000 square miles were practically unknown. There still remains about 120,000 square miles of the northern portion of the peninsula, between Hudson and Ungava bays, totally unknown to anyone except the wandering bands of Eskimo who occasionally penetrate inland from the coast.

Atlantic Coast.

The Atlantic coast is exceedingly irregular, being deeply cut by many long narrow bays, or fiords, so that the coast-line exceeds many times the direct distance from Belle Isle to Cape Chidley. Hamilton Inlet is the largest and longest of these inlets, extending inland over one hundred and fifty miles from its mouth. Among others, Sandwich, Kaipokok, Saglek and Nachvak bays are from thirty to fifty miles deep. These narrow fiords are surrounded by rocky hills that rise abruptly from the water to heights ranging from 1000 feet to 4000 feet. The water of the inlets is generally deep and varies from ten to one hundred fathoms. A fringe of small rocky islands extends almost continuously along the coast, with a breadth of from five to twenty-five miles. Outside the islands, the inner banks extend seaward for an average distance of about fifteen miles, and on them the water is rarely over forty fathoms deep. From this it will be seen that the fiords, as a rule, have greater depths than the banks outside the island fringe.

Formation of fiords.

To account for such an apparent anomaly, it is necessary to consider the formation of both the fiords and banks. The fiords appear to be valleys of denudation of very ancient origin, eroded, at least in part, when the elevation of the peninsula was considerably greater (at least 600 feet) than at present. Their remote antiquity is established by the deposition in their lower levels of undisturbed sandstones of Cambrian age. The banks are likely of comparatively recent formation, and appear to be made from material carried off the higher lands by glaciers and deposited by them as a terminal moraine among and outside the fringe of islands, to be subsequently flattened out by floating ice and currents, thus filling up the deep channels at the mouths of the fiords.

Northern coasts.

The coast adjacent to Hudson Strait and Ungava Bay has not been examined closely, but enough is known for us to state that it is generally bold, with highlands rising immediately from it. Small rocky islands form a narrow fringe in many places, especially about Ungava Bay, and the coast is indented with small bays, but not to such an extent as the Atlantic coast.

Hope's Advance is a western extension of Ungava Bay, as yet unexplored. The navigation of Ungava Bay and Hudson Strait is rendered dangerous to sailing craft by the strong currents and exceedingly high tides, the latter having a mean rise in Ungava Bay of nearly forty feet, and at exceptional spring-tides they have been known to rise sixty feet. Dangerous currents.

From Cape Wolstenholme to near Cape Jones, at the entrance to James Bay, the eastern coast-line of Hudson Bay is high and rocky. The coast between the entrance to Hudson Strait and Cape Dufferin, a distance of nearly three hundred miles, has not yet been continuously explored. Mosquito Bay is situated along this part of the coast, and was formerly supposed to connect with Hope's Advance. Such has since proved not to be the case, and Mosquito Bay has been found to extend inland not more than seventy-five miles. Between this bay and Cape Dufferin, there is a fringe of islands stretching out from ten to twenty miles from the mainland. To the southward of Cape Dufferin, the coast-line remains high, and an almost continuous line of high islands of Cambrian rocks forms a safe channel for small boats, as far south as Great Whale River. This channel varies from two to eight miles in width. South of Great Whale River, to within a short distance of Cape Jones, the coast is unprotected and bold. Coast of Hudson Bay.

The eastern shore-line of James Bay is generally low, and the waters of the bay are very shallow and dotted far out with rocky islands and bouldery reefs, between which there is a perfect labyrinth of channels, navigable with small craft, but dangerous to approach with large vessels.

The north shore of the Gulf of St. Lawrence, in many places, has a more or less wide interval of low land, between the shore and the rocky plateau behind. From Seven Islands to Natashquan Point, the shore is comparatively regular and the islands few in number. To the eastward of Natashquan, as far as the Strait of Belle Isle, the coast is greatly indented by small bays and coves, and islands are numerous, especially between Cape Whittle and Blanc Sablon. Gulf of St. Lawrence coast.

The peninsula of Labrador is a high, rolling plateau, which rises somewhat abruptly, within a few miles of the coast-line, to heights between 1500 and 2500 feet, the latter elevation being somewhat greater than the watershed of the interior. The interior country is undulating, and is traversed by ridges of low rounded hills, that seldom rise more than 500 feet above the general surrounding level. From the barometer readings, taken during the season of 1894, in conjunction with stationary barometers at Hamilton Inlet and Anticosti, the general level of the interior plateau, about the Upper Hamilton General elevation and contour.

River and Lake Michikamau, near the central watershed, varies from 1600 feet to 1800 feet, and this may be taken as the general height of much of the interior of the peninsula. The highest part of the main interior mass is near the high granite area between the head-waters of the Peribonka, Manicuagan and Outardes rivers, flowing into the St. Lawrence, the East Main and Big rivers, flowing into Hudson Bay, and the Koksoak River flowing into Ungava Bay. The general elevation of this area exceeds 2000 feet.

Gradual slope towards James Bay.

The only portion in which the general level is attained by a gradual slope, is the part facing James Bay, where the land along the coast is low, and the rise eastward towards the interior is so light that one hundred miles inland it is only about 700 feet above sea-level.

Highlands of the St. Lawrence.

Beyond this the land continues to rise gradually, so that Lake Mistassini is only 1300 feet above sea-level. As before stated, the rise from the coast in other places is quite rapid; and along the St. Lawrence coast there is a range of high ground extending from the neighbourhood of Quebec to below the St. John River. The larger streams have cut deep valleys through this range. Along the Saguenay, at Cape Eternity, the hills rise almost shear 1500 feet above the river; while behind, in the Lake St. John region, few elevations exceed 1000 feet. On the Bersimis River, the high range begins about forty-five miles inland and continues to about the one hundredth mile, beyond which the country is comparatively level, and somewhat lower. On the Romaine and St. John rivers, the high lands formed from a great mass of irruptive rocks, begin about twenty-five miles from the coast, and are about fifty miles broad. The general level of this belt is nearly 2000 feet and many of the summits are more than 2500 feet above sea-level, while the general level of the country immediately behind them is not much over 1600 feet. H. Y. Hind* mentions similar high lands on the Moisie River, where the general level is above 1500 feet, and some of the mountain ranges are 3000 feet above sea-level.

Atlantic highlands.

Along the Atlantic coast, the land rises abruptly inland, almost everywhere, to altitudes varying from 1000 feet to 1500 feet, from the Strait of Belle Isle to the vicinity of Nain. To the northward of Nain the coast range is much higher, and, in the neighbourhood of Nachvak Bay, ranges of sharp, unglaciated mountains rise abruptly from the sea to heights varying from 2500 feet to 4000 feet; while farther north they are reported to culminate in peaks of 6000 feet, a few miles inland. With a slight decrease in height, this range con-

*Explorations in Labrador, vol. 1, chap. ix.

tinues northward to the barren islands at Cape Chidley. This mountain range appears to be confined to the coast region and probably is under fifty miles in width, the country on the western side sloping rapidly down to the level of the interior plateau. About Ungava Bay, the general level of the plateau is probably somewhat under 1000 feet, and the land rises gradually towards the interior. Little or nothing is known definitely of the great northern area between Ungava and Hudson bays, but, from observations by Dr. R. Bell, made along the coasts, the land appears to rise rapidly for 1000 feet, and then more gradually to elevations between 1500 and 2000 feet. From information obtained from the Eskimo at Ungava, there would seem to be a low tract of country extending westward from Hope's Advance towards Mosquito Bay on the Hudson Bay coast, and also another area of comparatively low country westward of the Leaf Lakes and of the Koksoak River valley.

The land fronting the Hudson Bay coast, as far south as Cape Jones, reaches the 1000 feet level within a short distance from the sea, and then rises quickly to a general level between 1500 and 2000 feet, the latter being the maximum of elevation in this region, as determined by the few explorations in this portion of the peninsula. The gradual rise from the seaboard of the country to the east and south-east of James Bay, has already been mentioned.

Elevation of land fronting Hudson Bay.

To sum up the foregoing statements of levels,—the interior of the peninsula is almost flat, so that in an area of 200,000 square miles, there is not a difference of general level of more than 300 or 400 feet, and the highest general level of the interior is under 2500 feet. A belt of land somewhat higher than the general interior follows the St. Lawrence coast, a short distance inland. The northern half of the Atlantic coast rises in a chain of mountains, considerably higher than any other portion of the peninsula. Along the northern and western coasts there is no evidence yet obtained to show the existence of a coastal ridge, but rather a probability that the general elevation increases towards the interior.

Summary of elevation.

Like the other portions of northern Canada underlain by glaciated Archæan rocks, the interior of the Labrador Peninsula is covered with myriads of lakes, that occupy, at a moderate estimate, at least one-fourth of the total area. In size, these vary from small narrow ponds, to lakes with surfaces hundreds of square miles in extent. Great Mistassini and Michikamau lakes have areas considerably exceeding 500 square miles. Among those of which the area is between 200 and 500 square miles, may be mentioned Manouan Lake, on a tribu-

Lakes.

tary of the Peribonka River, Pletipi Lake, at the head of the Outardes River, the Manicuagan lakes, on the headwaters of the river of the same name ; all sending their waters into the St. Lawrence. Discharging into the Atlantic are Winokapau, Petitsikapau, Ashuanipi and Attikonak lakes on the Hamilton River, and Grand Lake on the Northwest River, which also drains Lake Michikamau. On the rivers discharging northward, Lake Kaniapiskau is the only one yet partly explored, but reference to the map will show a number of large lakes on the various tributaries of the Koksoak and George rivers, which have been located from information derived from Hudson's Bay Company employees and Indians.

Western watershed

On the western watershed, Clearwater Lake is one of several large lakes lying in an area between the sources of the Stillwater branch of the Koksoak River, and the Nastapoka, Clearwater, Little and Great Whale rivers flowing into Hudson Bay ; all of which rise and flow through a number of large unexplored lakes.

Lake Nichicun is near the headwaters of the Big River and is drained by that stream. The Mistassini lakes discharge into the Rupert River, while the Nottoway River, which discharges into the southern part of James Bay, drains, among others, lakes Waswanipi and Chibougamoo.

Lakeless area.

Besides the lakes mentioned, there are hundreds having a surface area between 20 square miles and 100 square miles, while smaller lakes are numberless. The only portion of Labrador not thickly covered with lakes, is the low country extending inland for about 100 miles from the east coast of James Bay. This area has been covered with a deep mantle of marine sands and clays, which has filled up the inequalities of the surface, and prevented the formation of lakes ; it is covered instead by a net-work of small streams, with deep channels cut out of the stratified drift.

Formation of lakes.

The lakes, except the largest, are usually confined in the shallow valleys between low rocky ridges, by barriers of drift, and in consequence their depth is not great, seldom exceeding fifty feet, while many of them are under twenty feet deep. Mistassini and Michikamau lakes, occupying ancient basins, in which Cambrian rocks were deposited, are among the exceptions, the former having a depth of over 400 feet, while that of the latter is said, by the Indians to exceed 250 feet. Lake Winokapau, in the valley of the Hamilton River, and Lake Mouchalagan on the Manicuagan River, are other exceptions, the former being over 400 feet deep, and the latter 650 feet deep, but, as will be explained further on, these and Grand Lake, on the Northwest River, differ from the ordinary lakes in their manner of formation.

It follows, from the great number of lakes, that the country must be covered with a perfect network of streams discharging them. The discharges and lakes interlock so closely that, with a knowledge of the country, it is possible to travel with canoes in any direction, the longest portages never exceeding two or three miles. Great depths in lakes.

There are four principal watersheds to the peninsula: of these the southern is the smallest, its rivers rarely exceeding 300 miles in length; the most important are the Saguenay and its branches, Bersimis, Outardes, Manicuagan, Moisie, Romaine, Natashquan and St. Augustine. The eastern watershed drains chiefly into Hamilton Inlet, three large rivers flowing into its head. Of these the Hamilton River is much the largest, taking its rise near the middle of the peninsula and draining an area extending from latitude 52° to latitude 54° covering seven degrees of longitude. Its longest branch rises nearly 600 miles from its mouth. The other rivers of Hamilton Inlet are the Northwest and Kenamou, the former draining a large area to the north of the Hamilton River, the latter flowing in from the south-west. Apart from these three large streams, no other rivers of importance are found along the Atlantic coast, on account of the high lands of the coast cutting off the drainage of the interior and forcing it to flow northward into Ungava Bay. Rivers.

The Koksoak River is the largest stream flowing northward, and is probably the largest river of Labrador. Besides the main stream, there are a half dozen tributaries, each of which drains an important basin. The longest branch flows out of the northern end of Summit Lake, on the 53rd parallel of latitude, while a branch of the Manicuagan River flows out of the southern end of the same lake, thus connecting by water the Gulf of St. Lawrence with Ungava Bay. The total area drained by this river and its tributaries is about 60,000 square miles. The George River, is another great stream which rises in large lakes close to Lake Petitsikapau on the Hamilton River, and drains a wide area westward of the Atlantic coast range. The Whale River is a smaller stream lying between the George and Koksoak rivers. Koksoak River.

The western drainage basin is the greatest in Labrador and is emptied by large rivers, that rise far inland, close to the head-waters of the Koksoak and Saguenay rivers. Proceeding from the northward, the larger rivers flowing into Hudson Bay are:—The Nastapoka which flows out of several large lakes to the eastward of Clearwater Lake and near the head of the Stillwater branch of the Koksoak River; the Little and Great Whale rivers, that rise close to the western branches of the Koksoak; the Big River which rises in the mountainous area south Western rivers.

and east of the head of the East Main River, in about latitude 52°, and close to the sources of the Peribonka, Manicuagan and Outardes rivers tributaries of the St. Lawrence. From its source the Big River flows northward nearly one hundred and fifty miles, passing through Lake Nichicun, and then turns westward four hundred miles, emptying into James Bay, near latitude 54°

The East Main River takes its rise in a number of lakes close to Lake Nichicun and flows nearly west, discharging into James Bay a short distance north of latitude 52°. The Rupert River forms the discharge of the Mistassini lakes, and, having such large reservoirs at its head, is not subject to the same fluctuations of volume, as the other rivers. It empties into Rupert Bay close to the mouth of the Nottoway River, which drains a wide area to the south-east of Hudson Bay, and rises in a number of large lakes close to the height-of-land dividing it from the St. Maurice River, which joins the St. Lawrence at Three Rivers.

Ancient river channels.

The channels of most of the rivers of Labrador are of very ancient origin, apparently dating back to a period before the deposition of the Cambrian rocks. These valleys are cut deep into the general level of the plateau, their depth and length apparently depending on the volume of water carried, and thus showing that they have been mainly formed by normal denudation.

The larger rivers flowing southward, have deep valleys cut through the highlands of the coast region, and the streams are often from 500 feet to 1000 feet below the general level of the surrounding country. The heads of these valleys are from one hundred to three hundred miles from their mouths; and at their upper ends the rivers descend from the level of the interior in a succession of heavy falls, through narrow gorges where processes of erosion are at present extending and deepening the valleys. This erosion is, however, so exceedingly slow, that the change in the heads of the valleys, since glacial times, has been practically nothing, owing no doubt to the hardness and resistance to weathering of the Archæan rocks in which they are cut. The gorge of the Saguenay, with its almost vertical walls rising 1500 feet above the surface of the water, and its great depth of more than 800 feet in places, is an excellent example of one of these ancient river-valleys. That of the Hamilton River, which is cut back from the head of Hamilton Inlet for nearly three hundred miles, and of which the depth is from 700 feet to 1200 feet below the general level of the surrounding country, is another fine example of river erosion. The rivers occupying smaller valleys, are all of the same type. The East Main and Rupert rivers, flowing as they do on the gradual slope towards James

Bay, where the marine deposits of sand and clay are found inland about one hundred miles, have not the marked valleys found elsewhere, but descend in a number of steps, where they have either cut narrow gorges out of soft Huronian schists, or fall directly over granitic ledges. The ancient valleys of these streams appear to have been filled up during the deposition of these marine beds, and the present river-courses are of post-glacial origin.

New channels.

Before entering the ancient valleys above described, all the rivers in central Labrador flow almost on the surface of the country, and are broken into chains of lakes often formed by dams of glacial drift, which in other places form low ridges that divide the streams into different channels. These channels wander about on the lower levels of the interior country in a most bewildering manner, and render travel without a guide excessively difficult.

Climate.

Climate along the coasts.

The climate of Labrador ranges from cold temperate, on the southern coasts, to arctic on Hudson Strait and the high lands of the northern interior, and is generally so rigorous that it is very doubtful if the country will ever be fit for agriculture north of latitude 51°, except on the low grounds near the coast. Along the east coast of James Bay, good crops of potatoes and other roots are grown as far north as Fort George—about latitude 54°—while on the Atlantic coast of the peninsula, about the head of Hamilton Inlet, similar crops are easily cultivated. On the outer coast the climate is more rigorous, and appears to be much affected by the northern current, with its numerous floating icebergs, which lowers the mean temperature and renders the growth of root crops slow and uncertain at Rigolet in latitude 54°. Garden vegetables are, however, grown at Nain in latitude 56° 30′; but extra precautions are taken with them, such as the building of walls to protect them from the east wind, and covers put over them when in danger from summer frost. At Fort Chimo, near the mouth of the Koksoak River in latitude 58°, with care small patches of turnips, lettuce and radishes are grown.

Climate of the interior.

In the interior, at the Hudson Bay's post of Mistassini, in latitude 50° 30′, a crop of potatoes is raised annually, but, owing to the shortness of the season and the prevalence of summer frosts, they rarely mature without the tops being frozen. No other vegetables are cultivated here at present. At Nichicun attempts are made to grow potatoes, but they have always proved more or less failures, owing to frosts in July and August. It will thus be seen that the prospects of the settlement of the central portion of Labrador, for purposes of agriculture, are by no means bright ; and, if settlements are made for other purposes, the inhabitants will have to depend largely on more southern localities for their vegetable food. Owing to the absence of grass plains, and to the mantle of moss and lichens that covers the surface of the ground almost everywhere, there is little likelihood that it will ever be a grazing district. The high lands of the interior have only two seasons, winter and summer. The summer season begins almost simultaneously throughout the interior, and the jump from winter into summer occurs as a rule during the first two weeks of June, when the snow disappears, and the ice leaves the rivers and lakes, except the largest, where it often remains until July. With the disappearance of the snow and ice, the temperature during the day rapidly increases, and the leaves are almost immediately put forth by trees and bushes. During 1894, frosts were of almost nightly occurrence until June 28th, when a thin sheet of ice was formed in the vessels about camp, and slight flurries of snow fell in the morning. After this date no frost was noted, but, thermometers having unfortunately been broken, the exact temperature could not be taken. To the north of latitude 52°, snow falls and ice begins to form in the small lakes about the middle of September. From early in October the snow remains permanently, and all the smaller lakes are solidly frozen, so that, for the greater part of the interior plateau, there is at most only three months of summer. The temperature during the winter season is often very low on the interior high lands, away from the influence of the sea. The coldest months are December, January and February, and the following readings of thermometers taken at Mistassini* in 1885, will give an idea of the temperature of that region, which appears to be somewhat higher than about Nichicun and the upper Hamilton River.

Absence of grass.

Summer season.

Winter season.

Temperatures at Lake Mistassini.

—	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.
Mean temperature	-18·5	-00·1	01·9	25·3	42·3	53·1	59·9	56·7
Highest temperature	16	39	35	54	85	79.	76	81
Lowest temperature	-56	-46	-47	-19	08	30	39	31

Great thickness of ice.

According to reports of the Indians, the ice in Lake Michikamau is 7 feet 6 inches thick on an average, and the amount of continuous frost to form such a thickness must be very great. The ice in Lake Winokapau, in the deep valley of the Hamilton River, was from actual

*Annual Report, Geological Survey of Canada, vol. I. (N.S.), 1885, p. 16 D.

measurement found to be 4 feet 9 inches. From the journal kept at the post on this lake, between 1866 and 1874, the first snow generally fell about September 20th and continued until June, the latest record being June 10th. The lowest temperature recorded was 55° below zero. Geese and summer birds arrived on or about May 10th. From the journals at Northwest River post, the lowest temperature recorded from 1867 to 1893, was 53° below zero. There are several observations of 45° below zero, which appears to be the minimum winter temperature of most years. At Rigolet, where the temperature is moderated by the open sea, the thermometer rarely registers 40° below zero. At Fort Chimo, where the open sea is not far distant, 45° below zero is said to be the lowest temperature registered. The summer temperature of the Atlantic coast region is considerably lower than inland or along the western coast. As a rule the thermometer in the interior—north of Mistassini—rarely rises above 80° during the middle of the day on more than a few days during the summer season. Lake Winokapau. Hamilton Inlet. Fort Chimo.

Winds. The temperature depends greatly on the direction of the winds. During the summer, south and south-west winds prevail in the interior, and are accompanied by higher temperature and often overcast sky, with drizzling rain. The west and north-west winds bring clear weather with lowering temperature, especially during the winter season. North and north-east winds are usually accompanied by heavy storms of rain and snow, with cold moist atmosphere. East and south-east winds, as a rule, blow with clear pleasant weather.

Rain. The precipitation of moisture over the interior area is not great. During the winter the snowfall varies from three to six feet, and the greater part of it descends during the periods of north or north-east wind, which are not common; the north-west wind, blowing at least three-quarters of the time during the winter season, is accompanied by a bright clear atmosphere. During the summer season the precipitation, if not great, is constant, as a day rarely passes without drizzle, or thunder showers, which lower the temperature.

Bays on Atlantic coast freeze over. At Northwest River, the head of Hamilton Inlet freezes completely over between the 1st and 15th of December, and opens again between May 15th and June 15th. Snow falls early in October, and from that date to about the first week in May, the latest record being July 2nd. At Rigolet, the outer part of Hamilton Inlet rarely or never freezes solid before the middle of January, and in some winters does not close at all. This is due to the strong currents in this part of the inlet. Sandwich Bay, nearly one hundred miles farther south, generally freezes over in the end of December, and the same time may be taken as that of the closing of most of the larger fiords of the

Snow.

Atlantic coast. About Fort Chimo, the lower grounds are permanently covered with snow by the 1st of December, this covering remaining until the 10th of June. The higher hills retain snow until the last of August, and by the middle of September snow again covers the tops of the distant high hills.*

Soil.

Character of soil on the Archæan area.

The soil of the greater part of the peninsula is derived from the underlying Archæan rocks, and is mostly in the form of glacial till, mixed with boulders of various sizes. The till is a mixture of sand and clay in which the former greatly predominates. In many large areas which have been traversed by fire, much of the vegetable matter of the surface has been destroyed, and the remaining soil supports only a scant growth of small trees. Along the sides of the river-valleys the drift has been re-arranged and mixed with sediments. Here the soil, though generally light and sandy, is richer than the unmodified till; and the size and variety of trees growing on it are consequently greater.

Marine deposits.

Within the limits of the marine deposits, about the margins of the peninsula, the stratified sands are underlain by bedded clays, and as the coast is approached, the overlying sands thin out, leaving the clays near the surface, thus producing a light soil with a heavy subsoil, on which the vegetation is much better than anywhere else, except on the lower banks and islands in the rivers near the coast, where the sands and clays are topped with deposits of alluvium.

Cambrian débris.

The soil covering the areas of Cambrian rocks, being made up of the débris of limestone, shale, and other rocks of this formation, is of a heavier nature than that formed from the Archæan rocks; and the change from one to the other is marked by the better growth of trees on the former.

Trees and Other Plants.

Various trees.

The southern half of the Labrador Peninsula is included in the sub-arctic forest belt, as described by Prof. Macoun.† Nine species of trees may be said to constitute the whole arborescent flora of this region. These species are :—*Betula papyrifera*, Michx., *Populus tremuloides*, Michx., *Populus balsamifera*, Linn., *Thuya occidentalis*,

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* Annual Report U. S. Bureau of Ethnology, 1889 90.—Ethnology of the Ungava District. L. M. Turner, p. 172.

† The Forest Trees of Canada. John Macoun.—Trans. Royal Soc. Canada, Sec. iv., 1894, pp. 5-7.

Linn., *Pinus Banksiana*, Lam., *Picea alba*, Link., *Picea nigra*, Link., *Abies balsamea*, Marsh, and *Larix Americana*, Michx.

Distribution.

The distribution of the forest areas and the range of the various trees depend on several factors, among which may be mentioned, position as regards latitude, height above sea-level, distance from sea-coast, and character of the soil, all of which are important.

Forest areas.

The forest is continuous over the southern part of the peninsula to between latitudes 52° and 54°, the only exceptions being the summits of rocky hills and the outer islands of the Atlantic coast. To the northward of latitude 53°, the higher hills are treeless and the size and number of the barren areas rapidly increase. In latitude 55°, more than half the surface of the country is treeless, woods being only found about the margins of small lakes and in the valleys of the rivers. Trees also decrease in size until, on the southern shores of Ungava Bay, they disappear altogether. The Leaf River, which empties into the bay a few miles north of the mouth of the Koksoak River, is the northern limit of forest trees on the west side of Ungava Bay.

Barren grounds.

Along the east coast of Hudson Bay, Dr. Bell found trees growing a few miles beyond the north end of Richmond Gulf.*

In the neighbourhood of Clearwater Lake, the writer found many clumps of black spruce and larch, and, according to Indian reports, small patches extend to the Nastapoka River in latitude 57°. So that a line drawn a little south of west, from the mouth of the Leaf River to the mouth of the Nastapoka River on Hudson Bay, would give a close approximation to the northern tree limit of western Labrador.

Northern tree limit.

The tree-line skirts the southern shore of Ungava Bay and comes close to the mouth of the George River, from which it turns south-south-east, skirting the western foot-hills of the Atlantic coast range, which is quite treeless, southward to the neighbourhood of Hebron, in latitude 58°, where trees are again found in protected valleys at the heads of the inner bays of the coast. At Davis Inlet, in latitude 56°, trees grow on the coast and high up on the hills, the barren grounds being confined to the islands and headlands, which remain treeless to the southward of the mouth of Hamilton Inlet. These barren islands and bare headlands of the outer coast, along with the small size of the trees on the lowlands, have caused a false impression to be held regarding much of the Atlantic coast, which from Hamilton Inlet southward is well timbered about the heads of the larger bays and on the lowlands of the small river-valleys.

Atlantic coast.

*Report of Progress, Geol. Surv. Can., 1877-78, p. 256.

The distribution of each of the several species of trees depends on conditions similar to those affecting the forest areas in general.

Distribution of white birch.

Betula papyrifera, Michx. (White, Paper, or Canoe Birch) is found everywhere throughout the southern portion of the peninsula. Except in the district to the south-west of Lake Mistassini, drained by the Nottoway River, and on the southern watershed, the trees do not grow sufficiently large or straight to afford bark for canoe building, and the Indians of the more northern portions have to depend upon bark imported by the Hudson's Bay Company for their canoes. About Lake Nichicun and on the upper waters of the Hamilton River, the largest trees rarely exceed eight inches in diameter. The trees are found in thickets of second-growth, on the hillsides which have been traversed by fire; they also grow sparingly in unburnt portions. Northward of Nichicun, the white birch becomes rapidly smaller and along the upper Koksoak River does not average three inches in diameter. At Cambrian Lake, where the limestones are encountered and the river-valley is deep and protracted, the size of the trees improves, and birches six inches in diameter are not uncommon. Below the junction of the Swampy-bay River, the trees again become small, and finally die out on the Koksoak River a few miles above Fort Chimo. On the Hudson Bay side, the northern limit of white birch is near the mouth of the Great Whale River, while inland it is found, in small straggling clumps, at the head-waters of the south branch of that river. About Hamilton Inlet, birch is common, and, at the head of the inlet, trees up to ten inches in diameter are not uncommon.

Northern limits.

Distribution of aspen.

Populus tremuloides, Mich. (Aspen). The range of this tree depends, to a great extent, on the nature of the soil. In the southern portion of the peninsula, it is found as a second growth along with the white birch, and also in clumps in the original forest. It appears to be most plentiful on the western half of the peninsula, where it grows most abundantly on the unmodified glacial till of the drift ridges. At Lake Mistassini, this tree is abundant and is often ten or twelve inches in diameter about the southern portion of the lake. Along the upper East Main River, only small clumps of bent and twisted trees are seen, while about Nichicun it is exceedingly rare. To the northward of Nichicun, this tree was not seen along the route followed to Ungava Bay. On the Hudson Bay coast, the neighbourhood of Cape Jones is the northern limit of the aspen; while inland it is found on the portage-route, between the lower and upper parts of the Big River, in latitude 54°. About the head of Hamilton Inlet, and along the river below the Grand Falls, clumps of aspen are frequently met with. But above the Grand Falls this tree was not seen anywhere on the waters of the Hamilton River, its first occurrence on the route southward being near the portage-route leading to the Romaine River from Lake Attikonak. Along the Romaine River, it soon becomes common as the stream is descended. On the Manicuagan River aspen is found in the deep river-valley to beyond latitude 52°, but does not grow on the surrounding table-land.

Populus balsamifera, Linn. (Balsam Poplar) is met with farther north than the aspen; but it appears to confine itself to the heavy clay soil of the river-valleys, or to the modified drift of the Cambrian areas. It is met with along the Big and East Main rivers, flowing into Hudson Bay, and its northern limit on this side of the peninsula is the Bishop Roggan River, the next stream north of the Big River. Along the rivers of this coast, balsam poplar was only met with for about one hundred miles inland from the coast, where its limit was that of the stratified marine clays of the river-valleys. On the upper East Main River, it was nowhere seen, and it does not appear to grow northward of Lake Mistassini in the western interior. After passing through an area of several hundred miles from Mistassini to Eaton Cañon, on the Koksoak River, balsam poplar is again found growing in the valley of that river and continues to be found at intervals, to within twenty-five miles of Fort Chimo. At the head of Cambrian Lake, large clumps of trees of this species, ten inches in diameter, were observed growing on the low terraces, but elsewhere they were small and straggling. On the lower Hamilton River, balsam poplar is common. Above the Grand Falls it is not found along the river, for upwards of a hundred miles, until the Cambrian area about Birch Lake is reached, when small trees of this species become common, and continue along the Ashuanipi Branch to the end of survey. On the Attikonak Branch, a few small trees were noted between Sandy Lake and the height-of-land to the southward.

Distribution of balsam poplar.

Northern limit.

Thuya occidentalis, Linn. (Cedar) hardly enters the southern limits of the peninsula. It occurs just south of the mouth of the Rupert River, at the foot of James Bay, and does not cross that stream in the eastern course of its northern limit. It is only found about the south-western bays of Mistassini Lake, from which it extends south-east, crossing the St. Lawrence to the westward of Seven Islands. No cedar trees were seen along the Manicuagan River from its mouth upward.

Distribution of cedar.

Pinus Banksiana, Lam. (Banksian Pine, Jack Pine, Cypress) is limited in its extension by an eastern as well as a northern boundary.

Distribution of Banksian pine.

It grows freely over the western half of the peninsula, and appears to prefer the dry, sandy drift ridges and rocky hills, where it is often found along with black spruce, as a second growth, covering areas devastated by fire. Its northern limit is the south branch of the Great Whale River, south of which it occurs abundantly to the shores of the St. Lawrence, but does not come quite to the coast on Hudson or James Bay, probably on account of the shore being generally low and swampy. Inland, it is met with abundantly, along the East Main River, to the Long Portage Creek, near its head, in about longitude 71° W. Here a line running nearly north and south terminates the eastern extension of the Banksian pine. About Nichicun only a few small clumps are found to the westward of the lake, and it is unknown to the Indians to the eastward. In the southern extension of its eastern limit, the line runs somewhat east of south and reaches the St. Lawrence in the neighbourhood of the mouth of the Moisie River, being everywhere common along the main branch of the Manicuagan River.

Northern limit.

Eastern limit.

Distribution of white spruce.

Picea alba, Link. (White Spruce) is found throughout the wooded area of the peninsula, but it is not everywhere common, and there are several areas where it is rarely found. Its distribution is but little affected by climate or by height above sea level; it appears to depend altogether on the soil. North of the southern watershed, it is confined to the areas of re-arranged drift of the river-valleys and marine deposits along the coast, or to the heavier drift of the Cambrian areas of the interior. Along the western coast, the interior limit of this tree, on the East Main and other rivers flowing into Hudson Bay, coincides closely with the margin of the marine deposits, and consequently does not extend one hundred and fifty miles eastward from that coast. From Lake Mistassini, along the route to Nichicun, no trees of this species were met with, but it is said to grow sparingly about the latter place. A few small trees were observed on terraces between Nichicun and Lake Kaniapiskau. Along the upper Koksoak River, small trees were seen occasionally on its terraced banks to Eaton Cañon. Below this place, the number of trees and their size increased rapidly in the river-valley, and from here to the forks of the Stillwater many of them exceeded eighteen inches in diameter three feet from the ground and were over fifty feet in height. Below the Stillwater, their size rapidly decreased, and the trees died out near the mouth of the Koksoak River, along with the black spruce and larch, of which the northern limit is about co-terminous with that of the white spruce. About Hamilton Inlet, white spruce is abundant on the lowlands, and at the mouths of the Kenamou and Hamilton

Northern limit.

rivers many large sticks have been taken out for spars and masts for schooners. Here, and along the Hamilton River valley, where unburnt, this tree often exceeds eighteen inches in diameter, and grows sufficiently tall to allow of three good twelve-foot logs being cut out of a single tree. Above the Grand Falls, white spruce is found along the river banks, but is generally small and scattered until the Cambrian area of the upper waters is reached, when it becomes more abundant and grows well up the hillsides. Many of the trees of this region are very stout at their bases, but being short and branching would make poor lumber. To the southward of the Cambrian area, on the Attikonak Branch and the upper Romaine River, very few trees of this species are seen until the latter stream enters its ancient valley, when they become more abundant. They are found everywhere in the valley to the St. Lawrence. In the valley of the Manicuagan River, trees of this species attain a large size and are very abundant to Lake Mouchalagan, above which they gradually become fewer and smaller, and die out near the mouth of the Attikopi River. Good timber.

Picea nigra, Link. (Black Spruce) is the most abundant tree of Labrador and probably constitutes over ninety per cent of the forest. It grows freely on the sandy soil which covers the great Archæan areas, and thrives as well on the dry hills as in the wet swampy country between the ridges. On the southern watershed the growth is very thick everywhere, so much so that the trees rarely reach a large size. To the northward, about the edge of the semi-barrens, the growth on the uplands is less rank, the trees there being in open glades, where they spread out with large branches resembling the white spruce. The northern limit of the black spruce is that of the forest belt; it and larch being the last trees met with before entering the barrens. Distribution of black spruce.

Abies balsamea, Miller. (Balsam Fir, or Spruce,) is another species that grows only on suitable soil. It is found nearly to the edge of the barren grounds. Throughout the wooded regions it grows more or less plentifully about the margins of the larger streams and lakes, apparently preferring soil containing considerable moisture and alluvium. Northward of the southern watershed, it is rarely found away from the edges of rivers and large lakes, and is wanting along the portage-routes connecting the larger streams. On the Hudson Bay coast, its northern limit is near the Great Whale River. On the Koksoak River a few trees were seen below the junction of the Stillwater. Along the Hamilton River it grows everywhere and was also found growing about the shores of Lake Michikamau. Distribution of balsam fir. Northern limit.

Distribution of larch.

Larix Americana, Michx. (Larch, Tamarack, 'Juniper'), is probably the hardiest tree of the sub-arctic forest belt; it grows everywhere throughout the Labrador Peninsula, and is probably next in abundance to the black spruce. Throughout the interior it is found growing in all the cold swamps, and is always the largest tree in the vicinity. Along the northern margin of the forest, the larch continues as a tree to the very edge, where the black spruce is dwarfed to a mere shrub. The larch of the southern region has been almost totally destroyed by the ravages of the imported, European larch saw-fly *(Nematus Erichsonii)*. The present range of this pest extends northward from Lake St. John to beyond Lake Mistassini, and appears to be yearly spreading northward and eastward, but has not yet reached the St. John or Romaine rivers flowing into the Gulf of St. Lawrence.

Destruction by saw-fly.

Forest areas of commercial value.

Areas of forest of sufficient size, with trees large enough for commercial purposes, are confined to the southern watershed and to the lower courses of the streams flowing into the Atlantic or Hudson Bay. It is very doubtful if such areas occur along these coasts to the north of latitude 54°. Much of the timber of the more southern regions is not of the best and would afford only spruce deals, while the greater part could hardly be profitably worked in competition with the western pine; but the time will probably come when the trees of the more favourable portions of Labrador will be profitably worked into lumber, especially if the smaller growths are cut at the same time for the manufacture of paper pulp.

Forest fires.

At least one half of the forest area of the interior has been totally destroyed by fire within the past twenty-five or thirty years. These fires are of annual occurrence and often burn throughout the entire summer, destroying thousands of square miles of valuable timber, to the south of the central watershed. The regions thus devastated remain barren for many years, especially towards the northern limits, and the second growth of black spruce, Banksian pine, aspen and white birch is never as good or as large as the original forest. These fires are due to various causes, but the majority of them can be traced to the Indians, who start them either through carelessness or intentionally. The Nascaupee Indians of the semi-barrens signal one another by smoke made by burning the white lichens that cover most of the ground in the interior, and these signals cause many of the fires. The southern Indians signal in a similar manner, but do not practice it to such an extent as their northern brethern, having found that they are rapidly destroying their hunting grounds. Careless camp fires in dry seasons are another common cause of these forest fires, and many of those ascribed to lightning, if closely traced

Causes of fires.

would be found to have been set by wandering Indians, who are only careful on their own hunting grounds. From what is seen on the explored routes of the southern watershed, it would appear that at least one half of the forest has been removed by this cause.

Great fire of 1870-71.

The greatest fire of modern times occurred in 1870 or 1871, and swept the country south of the height-of-land, from the St. Maurice to beyond the Romaine River. The second growth is just beginning to cover up the traces of this great conflagration, which ruined the pioneers of Lake St. John, and it will be years before the country is generally again well wooded. The upper Romaine river-valley has been totally burnt over within the last ten years, and the margin of this great burnt area has been extended southward during the summers of 1893 and 1894, so that now practically no green woods exist along the course of this river from the St. Lawrence to its source. The country surrounding the Hamilton River is in a similar state; except patches of original forest, along the lower part of the river-valley and about Hamilton Inlet, only blackened stumps or a small second growth are seen along its course, with an occasional oasis of large green wood to break the monotony. In this region great fires occur annually; that of 1893 covered hundreds of square miles of the table-land between the Hamilton and Northwest rivers. Similar remarks apply to the forests of the western watershed, more than half of which have been burnt.

Romaine River.

Hamilton River.

Willows.

Throughout the forest belt, the lowlands fringing the streams and lakes are covered with thickets of willows and alders. As the semi-barrens are approached, the areas covered by these shrubs become more extensive, and they not only form wide margins along the rivers and shores of the lakes, but with dwarf birches occupy much of the open glades. The willows and birches grow on the sides of the hills, above the tree line, where they form low thickets exceedingly difficult to pass through. Beyond the limits of the true forest, similar thickets of Arctic willows and birches are found on the low grounds, but on the more elevated lands they only grow a few inches above the surface. In the southern region, the undergrowth in the wooded areas is chiefly Labrador tea *(Ledum latifolium)* and "laurel" *(Kalmia glauca)*, which grow in tangled masses, from two to four feet high, and are very difficult to travel through. In the semi-barrens this undergrowth dies out, and travel across country is much easier in consequence. In the southern regions the ground is usually covered to a considerable depth with sphagnum, which northward of 51° is gradually replaced by the white lichens or reindeer mosses *(Cladonia)*, which grow freely everywhere throughout the semi-barren and barren regions.

Small fruits. The distribution of small fruits and berries is of some importance and may be recorded here, although they are included in the plant list of Appendix VI.

Cherry. *Prunus Pennsylvanica*, Linn. (Wild cherry) is found in burnt areas northward throughout the interior to about latitude 55°, where it grows in small bushes, rarely more than four feet high.

Bake-apple. *Rubus chamæmorus*, Linn. (Cloudberry, Bake-apple, Yellow-berry) is found in the swamps everywhere throughout Labrador to beyond the tree limit, and forms an important article of food for the Indians.

Arctic raspberry. *Rubus arcticus*, Linn. (Arctic raspberry, Dewberry, Eye-berry) grows in the opens, along the banks of northern streams, and is especially abundant on the islands along the east coast of Hudson Bay. It is a much larger fruit, and has a more delicate wine-flavour than the next species.

Dewberry. *Rubus triflorus*, Richards (Dewberry, Eye-berry) is found along the banks of streams and on the edge of woods northward from the St. Lawrence to about latitude 54°, where it occurs rarely on the banks of the upper Hamilton River and about Lake Nichicun.

Raspberry. *Rubus strigosus*, Michx. (Red raspberry) is limited to about the same range as the last species, being found in burnt woods as far north as latitude 54°.

Strawberry. *Fragaria Virginiana*, Duchesne (Wild strawberry) is not abundant in the interior, owing to the absence of grassy glades, or opens; it is only found on grassy banks, at the ends of well-used portages, or in the clearings about the Hudson's Bay Company's forts, as at Mistassini, Nichicun and the abandoned Fort Nascaupee, on the Hamilton River. Along the coast of Hudson Bay, it is found abundantly on the islands, to beyond Fort George, in latitude 54°.

Indian pear. *Amelanchier Canadensis*, Torr. and Gray (June-berry, Indian pear). Of this species both the *oblongifolia* and *oligocarpa* varieties are found, northward, to the Big and Hamilton rivers. The latter variety is most common, and is much inferior in fruit to the rarer variety. It grows in glades, generally in swampy ground. The first variety is confined to the burnt areas and hillsides.

Blueberries. Several species of *Vaccinium* are found abundantly throughout the peninsula, growing on the burnt districts of the south, and in the open country of the semi-barren and barren lands.

Vaccinium Pennsylvanicum, Gray (Blueberry), is very abundant throughout the southern region, where it grows profusely on the extensive burnt lands, as far north as the East Main and Hamilton rivers, and is abundant at Nichicun, where the fruit is often destroyed by summer frosts. It was found abundantly along the Koksoak River, nearly to the Stillwater Branch. On the Atlantic coast, it has been found northward to the vicinity of Nain, while on the Hudson Bay coast, it reaches nearly to the Great Whale River. Its fruit is used largely by the Indians, who during the later summer months subsist largely upon it. It is eaten both raw and in the form of jam, and, mixed with a small proportion of flour, it is made into bread or cake.

Vaccinium uliginosum, Linn. (Duck-berry) is a more northern form, which, on the edge of the semi-barrens, largely replaces the last mentioned species. In the southern portions of the peninsula, it is only occasionally found on the banks and islands of the rivers. In the vicinity of the Hamilton and Big rivers, and northward, it is found growing profusely in the open spaces, along with *V. Pennsylvanicum*, and continues northward into the barren grounds, where it occurs as a small spreading shrub, growing only two or three inches high. The fruit of this species is more acid and firmer than the southern blueberry, and is not as pleasant to the taste, especially when cooked, having then a disagreeable flavour. It is also an important article of food to the Indians and Eskimo. Duck-berry.

Vaccinium cæspitosum, Michx., is a more northern variety than the last, being found on the summits of the higher hills about the headwaters of the Hamilton River. It continues abundant to beyond the mouth of the Koksoak River.

Vaccinium Vitis-Idæa, Linn. (Cranberry, Pomme de terre) is the most important berry of the northern half of Labrador. South of latitude 51°, it is found only on the summits of barren rocky hills, or on barren islands in the larger lakes; but to the northward, as the open barren spaces increase, it soon becomes abundant, and about the Hamilton and Big rivers is very plentiful everywhere, growing on the low ridges of drift as well as on the rocky hills. It continues to be abundant to the northward of the Koksoak River. Owing to the lasting qualities of the fruit and its improvement by frost, large quantities are gathered annually by the inhabitants, before the ground is covered with snow, for use during the long winter, throughout which the berries keep perfectly, and counteract the ill effects of the constant meat diet of the Indians and other inhabitants. The fruit is found in perfection, immediately after the disappearance of the snow in the spring, and continues good for several weeks, until the juices are dried up by the sun. Cranberry.

Crow-berry.

Empetrum nigrum, Linn. (Crowberry) is abundant throughout the semi-barren and barren regions of the peninsula, growing freely on the coast and inland. Where the various species of *Vaccinium* are absent, its fruit is eaten by the natives; but, as it is watery and not well flavoured, it is not esteemed as highly as the other berries. It is a favourite food of the curlew, and is eaten by geese in the early spring.

List of plants.

The lists of plants contained in Appendix VI. show the distribution of the flora of the Labrador Peninsula, including different areas of the interior where collections have been made, and also the Atlantic and Hudson Bay coasts.

Population.

Inhabitants.

With the exception of the white settlements along the north shore of the Gulf of St. Lawrence and on the Atlantic coast, and the few whites employed by the Hudson's Bay Company in the interior and on Hudson Bay, the inhabitants of the Labrador Peninsula are either Indians or Eskimo.

Difficulty in making a census.

It is very difficult to arrive at more than a rough approximation of the numbers of Indians inhabiting the interior, owing to their habits of roving from one Company's post to another; and the consequent liability to counting the same family several times, if the returns are computed from the books of the various posts, which is the only available data for any exact enumeration.

Number of Indians.

From the returns given in the reports of the Department of Indian Affairs, the Indians of the Gulf of St. Lawrence, including those of Lake St. John, numbered 1919 in 1888, and 1725 in 1893. These figures exclude 2860, under the heading of the "Nascopies of the Lower St. Lawrence," which number is the same in both returns. According to the same source, the number of Indians of Eastern Rupert Land is 4016; that of the Labrador (Canadian Interior) 1000, and that of the Atlantic coast 4000. The last probably refers to the Eskimo, but is not so stated. These returns would give a total native population of more than 13,000 persons, if the Indians of Eastern Rupert Land are those of the east coast of Hudson Bay.

In Appendix II., page 336, of the report of the Committee on the Hudson's Bay Company (1857), a return of the native population is given, compiled by the Hudson's Bay Company and others. The total number of natives trading at, and belonging to, the various posts in the Labrador Peninsula is given as 3885 persons; and this estimate, although probably somewhat high, is still much nearer to the native

Indian population than that given above. The population of the St. Lawrence coast is given as 1800 persons, which agrees closely with the Department of Indian Affairs returns for the years 1888 and 1893.* Of the remainder, 400 belonged to posts on the Atlantic coast, where probably a number of Eskimo are included, 950 belonged to the posts of the east coast of Hudson Bay, and the balance, 735, were attached to the posts of the interior. Since this return was made, the food resources and other conditions have changed considerably, and with them the distribution of the Indians.

Changes in population.

In 1857, there were seven trading posts in the interior of the peninsula, and at present there are but three, Waswanipi, Mistassini and Nichicun. Fort Chimo, near the mouth of the Koksoak River was not then opened. The policy of the Hudson's Bay Company was then to keep the Indians away from the coast and contact with opposition traders; this has now been changed, and the great body of the natives travel annually to and from their hunting grounds in the interior, to the various coast posts. In consequence, instead of 735 persons belonging to inland posts, at present there are not above 300 attached to these posts. The number of Indians trading at Northwest River and Davis Inlet, on the Atlantic coast, is about 200 persons. At Fort Chimo the famine of 1892-93 reduced the number of Indians in that district from 350 to less than 200 persons. Connected with the posts at Great Whale River, Fort George and Rupert House, on Hudson Bay, the total number of Indians does not exceed 1000 persons, and probably falls considerably short of that number, so that at the highest estimate the Indian population of the Labrador Peninsula does not exceed 3500, and is more likely nearer 3000.

Number of Eskimo.

The Eskimo inhabit the coast of the peninsula from Hamilton Inlet northward along the Atlantic coast to Hudson Strait, the east shore of Hudson Bay as far south as Great Whale River, while a few families live on the islands of James Bay. From the meagre returns available, only an approximate statement of their numbers can be compiled. In the census of Newfoundland (1891), the Eskimo are not separated from the white population of the Labrador coast; but, as the number of resident whites is not above 100 persons north of Hamilton Inlet, and as the Eskimo form about one-half the population of that place, from a total of 1191 persons there, and along the coast north of Hamilton Inlet, between 900 and 1000 may be taken as Eskimo. The following estimate of the Eskimo population living on Hudson

*The census return for 1891 gives a total of 1387 Indians belonging to the posts along the north shore of the St. Lawrence, to the eastward, and exclusive of, the Saguenay.

Strait and the east coast of Hudson Bay was supplied by Mr. R. Gray, who was for upwards of ten years clerk at Fort Chimo, and is well acquainted with the Eskimo of Ungava Bay:—From Cape Chidley to Hope's Advance, 51 families; about Hope's Advance, 30 families; from Stupart Bay to Cape Wolstenholme, 80 families; from Cape Wolstenholme to Great Whale River, 80 families. The average Eskimo family is small and rarely exceeds five persons. Taking this as the average, the total population to the west of Cape Chidley would be 1200 persons. This estimate is probably excessive, and 1000 persons would be nearer the number, if not still above it. According to the Newfoundland census of 1891, the total population of the Labrador coast between Blanc Sablon and Cape Chidley is 4106, including the Eskimo already referred to. Subtracting the 1000 Eskimo would leave a resident white population of 3106 greatly increased during the summer months by fishermen from Newfoundland. In 1890, 10,430 men, 2076 women and 828 children from Newfoundland were so engaged, in 854 vessels.

Whites on Labrador coast.

According to the Canadian census (1891), there is a white population of 5728, scattered along the north shore of the Gulf of St. Lawrence, to the eastward, and exclusive of those living about the mouth of the Saguenay River, who number 2440.

Total population.

To sum up, taking 3500 Indians, 2000 Eskimo and 8800 whites, the total population of the Labrador Peninsula is 14,300, or, roughly, one person to every thirty-five square miles.

The white population along the gulf coast consists largely of French Canadians who obtain a livelihood chiefly from the fisheries, with slight help from fur hunting during the winter. On the Atlantic coast the whites, northward from the Strait of Belle Isle to Sandwich Bay, are largely English speaking, and are either immigrants from Newfoundland, or the descendants of English fishermen formerly engaged in the salmon fishery. Northward of Sandwich Bay, the white inhabitants are, for the most part, descended from Hudson's Bay Company servants, who married Eskimo women and remained on the coast after their services had expired. They are known along the coast as "planters," and gain a fairly comfortable living from the cod and salmon fishery in the summer, and by fur hunting during the winter. They are all deeply in debt to the Hudson's Bay Company and Newfoundland fishing firms for supplies advanced. Having no capital of their own, they are compelled every spring, in order to carry on their fishing, to obtain supplies and nets from the merchants. If the season is favourable, they may be able to pay off their

"Planters."

debts at its close; but, as a rule, of late years they have been going deeper and deeper into debt, owing to the scarcity of fish along the coast where they are accustomed to make their fisheries. The natives ascribe the failure of the fishery to the numerous trap-nets now used along the coast by fishermen employed by the Newfoundland merchants. The use of these nets is said to be contrary to the law of Newfoundland, but, as there is no strict government patrol of the Labrador coast, the law is practically inoperative.

At the close of the fishery, the greater number of the "planters" leave their small houses on the coast, and proceeding to the heads of the various bays, go into winter quarters in their small houses there. During the winter they are engaged hunting fur-bearing animals. These also are not so plentiful as formerly, owing probably, to the large areas burnt over, either from fires accidentally made, or set on purpose by the owners of schooners, who often fire the country along shore, so as to easily make dry firewood for future seasons. Winter quarters.

Each "planter" has a "path," or line of traps, often extending fifty miles or more inland, and as these paths cannot be covered in one day, he has small "shacks," or log houses, at convenient intervals along them, where he can pass the night with some degree of comfort. Some of the paths are so long that they require a week to go over and attend to the traps on the way. Fur hunting.

During the months of April and May the planters and Eskimo are engaged at the seal hunt. They kill these animals on the ice of the upper part of the inlets, by watching at their holes or cracks, and spearing them when they come to breathe or sun themselves. Formerly the takes were large, but of late years they have been so small that many are abandoning the hunt. As soon as the ice leaves the bays, seals are taken in nets set along shore. The seals are used principally for local consumption, although some skins and a small quantity of oil are exported. The skins are used for outer winter clothing and other domestic purposes, while the fat and meat are preserved for dog food; for, as each "planter" has a team of dogs, varying in number from two to six, and as the Hudson's Bay Company keep a large number of dogs, a great quantity of seal meat is required. Seal hunting.

Notwithstanding the decrease in the fishery, furs and seals, the planters make a much better living than many of the poorer people in cities; and, if they were to exert themselves more, and were more thrifty, they might make a comfortable and independent living. As it is, with a reasonable amount of care, thought and labour, they can procure sufficient provisions to keep their families well fed, as in the Food supply.

fall, after the close of the commercial fishery, they can obtain an abundance of brook trout, that swarm at the mouths of all the streams flowing into the sea. At this time, spruce partridges are very plentiful on their migration from the coast inland, while, later, ptarmigan and rabbits are generally abundant. The proceeds of their fishery would easily provide them with flour and provisions, while all living inland might raise a small crop of potatoes; then, the proceeds of their winter's hunt would, in most cases, be ample to supply clothes for a year, and leave a surplus. This is, unfortunately, not the case, and a number of families are often without sufficient food and clothing every year.

Missionaries.

For the spiritual benefit of the whites, the Methodist church of Newfoundland has a mission station opposite Rigolet, in charge of the Rev. Mr. Pollock, who resides there a part of the time; the rest of his time being taken up with house to house visitations to the planters. As his district extends to and includes Sandwich Bay, one hundred miles to the south, where there is a large settlement, the time devoted to each family is small. The Episcopal church has a mission school at Sandwich Bay, in charge of Mr. L. Dicks, who also travels from house to house, instructing the children.

Education.

In spite of lack of educational advantages, nearly everybody can read and write, and all are very religious. As alcoholic liquors are not openly sold on the Labrador coast, cases of intoxication are exceedingly rare, and many of the younger people do not know the taste of alcohol. On the whole, these people compare favourably with those of more civilized regions, being frugal, moral, willing, good tempered, and naturally intelligent; their only fault, want of thrift and providence, is largely due to their mode of living, absence from any market of competitive labour, and the system of credit and debt under which they live.

Tribes of Indians.

The Indians of the Labrador Peninsula belong to tribes of the Algonkin family. The principal tribes of Labrador are the Montagnais, the eastern and western Nascaupees, and the coastal Indians of Hudson Bay. The Montagnais inhabit the country extending south of a line drawn westward from Hamilton Inlet, to the headwaters of the St. Maurice River. The Nascaupees inhabit the interior country north of this line, or from the bottom of James Bay eastward to Hamilton Inlet. The northern limit of their territory is marked by the Koksoak River, from its mouth to the Stillwater Branch, and by this stream westward to its head on the neighbourhood of Clearwater Lake, and thence westward to Richmond Gulf on Hudson Bay. This line divides the Indian territory from that of the Eskimo, and the boundary is well observed, the latter keeping far to the north of it, when hunting deer inland, and the Indians rarely crossing it from the southward.

The coastal Indians of Hudson Bay are confined to a narrow margin extending from the bottom of James Bay to Little Whale River, along the east coast.

The various tribes are closely related by intermarriage, and, although using different dialects, have many manners and customs in common. The northern Indians have apparently migrated to their present territory, from a south-west direction, as their language contains many words of the Sauteaux or Ojibway tongue; whereas the southern Indians speak purer Cree. The Nascaupees have traditions that their people originally dwelt far to the south, on the north side of a great river, with the sea to the eastward. They were driven northward by the Iroquois during the wars of the early French régime in Canada. Such was the terror inspired by the Iroquois, who followed them beyond the southern watershed to the shores of Hudson Bay, and eastward along the St. Lawrence to the Natashquan River, that at present they use their name to frighten the children. The writer had two Iroquois as canoemen on the Big and Great Whale rivers, and could only with great difficulty, induce the native Indians to accompany him inland along with their traditional foes and conquerors. There are several places between Hudson Bay and the Lower St. Lawrence, where great massacres of the natives were perpetrated by the Iroquois.

Close relation of different tribes.

Fear of the Iroquois.

The Montagnais are more or less of mixed blood, having intermarried with the old *coureurs des bois* and the French and English traders. This admixture of white blood is seen in the better physique of the tribe, the men being more muscular and broader than the pure Indian of the interior. As a rule, the men are of medium height, but a few are tall. The women are inclined to obesity as they advance in years, like their sisters of the northern tribes. The western Nascaupees are, as a rule, the tallest men in Labrador, many of them being six feet and over in height, straight and of light physique. The eastern Nascaupees are usually not above five feet six inches tall, slightly built and not at all muscular, being incapable of carrying half the loads of the Montagnais. They are also the dirtiest and most degraded Indians of Labrador. The coastal Indians have apparently a large admixture of white blood, as many of them have blue eyes and the men as a rule have strong beards. They bear in figure and face a certain resemblance to their northern neighbours the Eskimo, being heavily built and unlike the typical Indian. The admixture of white blood would account for this difference of physique, and it may also have

Montagnais.

Nascaupees.

Coastal Indians.

been induced by their living along the sea coast. Their resemblance to the Eskimo is not likely due to a blood relationship, as the Indians and Eskimo never take wives from one another, nor have sexual intercourse together.

Very little is known definitely about the philology and ethnology of the Indians, and the present account is only from desultory information picked up among them by the writer.

Language. The language, as before stated, is various dialects of Cree, or a mixture of Cree and Ojibway. The dialects are more numerous than those of the four tribes given above. The Montagnais of Lake St. John speak a somewhat different dialect from that of Bersimis, and it again differs from the dialects of Mingan or Northwest River. These differences of dialect in the same tribe are slight, and are mostly in the slang and interjections. The same differences apply to the dialects of the Nascaupee, Mistassini and Nichicun, differing from that of Fort Chimo, and all from that of Whale River and Rupert House. But these differences are all so small that the Montagnais canoemen conversed readily with the natives at Mistassini, Nichicun, Fort Chimo and Northwest River, and were only slightly puzzled on the coast of Hudson Bay, where the number of Ojibway words is greater. A

Religion. large majority of the Indians of Labrador are Christians, the Montagnais of the St. Lawrence and Hamilton Inlet being Roman Catholics, while the Indians of the western watershed have been converted by the missionaries of the Church of England. Only the eastern Nascaupees are pagans, and most of them have a faint tinge of Christianity, imparted on hurried visits by the Roman Catholic missionaries, between Hamilton Inlet and Ungava Bay. The christianized Indians are devoutly religious, attending strictly to the offices of the church during the long periods of absence from the eye of the missionary. While in the woods, they keep track of the weeks, ticking the days off on a rough calendar. They do not work on Sunday, and observe the fast days. Notwithstanding their careful observance of the offices, their religion is to a considerable extent leavened with old pagan superstitions, and a sneaking regard is still held for the windago and other

Conjurors. evil spirits of their forefathers. It is almost laughable to see the respect with which the most religious of them treat the well-known conjurors or medicine men of the pagan Nascaupees; and they all secretly believe that these persons can, if they wish, work harm by the aid of evil spirits. All the Christian Indians can read and write,

Education. those instructed by the English missionaries using a kind of syllabic shorthand, while those under the French missionaries make use of books printed in the ordinary way.

Dishonesty and theft are unknown to the interior Indians; provisions and outfit can be left anywhere inland with perfect safety for any length of time. Only in a case of absolute starvation will provisions be taken, and then only a small part, for which payment will be left by the person taking them. It is to be regretted that along the coasts, where the Indians are in close communication with the whites, their honesty suffers, and a good lookout must be kept, or property will be stolen. Honesty.

As a rule, the Indians have not a strict regard for the truth, and speak it only when convenient. The missionaries have improved the moral and sexual relations of the Indians, but there is still room for improvement in the latter respect. Morals. Marriages are made early, the men taking wives as soon as they can support them, and the women being given in marriage when they are fourteen or fifteen years old. Marriage. Among the Christian Indians monogamy is practised, and the marriage ceremony is performed by the missionaries, or, in their absence, by the officers of the Hudson's Bay Company. Among the pagan Indians many of the men have two wives, and some three or four, according to the number they can support by their hunt. Continence is not usual. Widows are in great demand in marriage, and often a young boy is mated to a woman old enough to be his mother. As a widow inherits her dead husband's hunting grounds, a marriage with her provides the second husband with hunting grounds as well as a wife, and in consequence widows are taken by young men without lands. The respect shown by children to parents is great, and the will of the aged father is law, even with middle-aged sons, who will not enter into any serious undertaking without first consulting the head of the family. Children. Children are never beaten, but soon learn to obey without punishment. As a rule, the number of children borne by the women is small, rarely exceeding five. The women become wrinkled and old before they are forty years of age; after which they often live for many years. The men show the effects of age much less than the women, and it is exceedingly difficult to tell their exact age between 50 and 70 years, as the hair rarely turns grey. The greatest mortality is due to pulmonary diseases, which are induced by exposure to cold and wet, with no covering on the feet but deerskin moccasins, which soak like blotting-paper. Disease. "Lame back" incapacitates a number of the men, and is probably due to disease of the kidneys. Complaints of the stomach are also the cause of many deaths, owing to the weakening of that organ by alternate periods of starvation and gormandizing. Scrofulous sores and ulcers are not uncommon, and appear to be inherited.

Burial.

The dead throughout Labrador are buried in the ground, and, only when death takes place during the winter, is the body placed in a tree until the frost is out of the ground. The clothing, gun and other articles belonging to the deceased are often buried with him, or placed on the grave, when the burial takes place in the woods, and no Indian would touch anything so left, or camp near one of these lonely graves. The dead are mourned for according to the position they occupied, and the grief displayed is deep and sincere. A curious custom was noted in the interior, on the arrival of the various families at the posts in the spring—instead of joyous greetings the women clasp one another and indulge in a period of silent weeping, after which they cheer up and exchange gossip.

Mode of living.

The annual routine of an Indian life is made up of two periods, the short period, from one to three months, spent during the summer at the coast, and the long period passed inland. Those who trade at the inland posts, are engaged throughout the summer transporting to Hudson Bay the fur hunt of the past winter and bringing back the supplies to form the next season's outfit. The amount of supplies is so great and the number of men at these posts is so small, that every one capable of working is enlisted, including half-grown boys and old men. As most of the women and children accompany the brigades of large canoes, in their small canoes, the journey practically amounts to a co-operative scheme of bringing in supplies, and differs only in this respect from the annual visit to the coast of the independent families. The only Indians who do not come in contact with the white traders during the summer, are some eighteen families who reside on the shores of a large lake about two hundred miles above the mouth of the George River. These Indians never visit the coast during the summer, and their only communication with the white traders is during the early spring, when the younger men tramp to Davis Inlet on the Atlantic coast, and there trade their furs for tea, tobacco and ammunition. They do not buy clothing or provisions, and haul their purchases home on long narrow toboggans over the crusted snow. This little tribe of Indians carries on a small trade in the above mentioned articles with the other neighbouring Indians of the interior. As they reside in a district plentifully supplied with caribou, they depend upon these animals both for food and clothing, and are thus practically independent of the traders.

Annual visit to the coast.

The majority of the Indians who go to the coast, congregate at convenient centres in bands of six or more families, and in company descend the rivers in their small bark canoes. The time of the spring gathering is shortly after the ice leaves the rivers, when the fur of the otter becomes "common." Each family carries with it the packs of furs obtained during the winter, together with most of their movable property. Those living farthest inland are often more than two weeks in descending to the post, owing to the long and difficult "roads" they have to follow. On arrival at the coast, the fur-packs are handed over to the trader with whom the Indian deals, and a valuation being set upon them, the Indian is allowed credit for the value computed in "skins" or "beavers," which are the units of value in the trade—the price of the different furs being reckoned in comparison with a medium sized beaver skin, and the traders' supplies are valued in the same manner. On the St. Lawrence coast this system of barter is falling into disuse, and cash is taking the place of the old beaver as a medium of exchange. The summer season at the posts is passed in visiting friends and in a round of gaiety. Very few of the Indians have been induced to cultivate land on their own account, although they sometimes work in the gardens of the traders and missionaries. The only work that they willingly undertake is in canoes, either attending fishing parties or transporting provisions inland. During the summer season a majority live in small cotton tents, but some of the most successful hunters own small log houses, in which they pass the summer. During the month of August, preparations are made for the journey to winter quarters, and by the end of that month most of the Indians leave the various posts.

Fur trade.

Summer life.

Owing to the extermination of the caribou in many parts of the country and to an insufficiency of other game, the greater number of the Indians are now obliged to purchase a considerable quantity of flour, and carry it inland to their hunting grounds.

So much provisions, along with other outfit, are now taken by the southern Indians that they have to make two or three trips with their canoes at starting, and often they are more than two months in reaching their winter quarters. In former years, the Hudson's Bay Company and other traders annually advanced the Indians sufficient provisions and outfit to carry on their winter's hunt, and recouped themselves in the following spring. At present, to a great extent, this system of advances has been abandoned, and the Indian only gets such outfit and provisions as he can pay for in cash or fur. The change is due largely to the losses entailed by close competition, and to the dishonest practices of many of the Indians, who instead of delivering their fur to the persons who advanced to them, take it to rival traders and exchange it for cash or other articles—leaving their debts unpaid. The change is consequently justifiable where there is competition in the fur trade, but bears heavily on the Indian, who is naturally improvident

Transport of supplies.

Change in system of trade.

Its relation to the Indian.

and spends the proceed of his annual hunt as soon as he gets it, without thought or care. In consequence, when the hunt is a failure, which is often the case through no fault of the hunter, the poor Indian has little or nothing to buy his outfit with, and departs to the woods improperly supplied. To this cause is due much of the hardship, starvation and death reported among the Indians of the Labrador Peninsula during the past few years. With the exception of the eastern Nascaupees, all the Indians now dress in clothing procured from the trading shops, and many of the southern Indians, having acquired a taste for luxuries of civilization unknown to their fathers, must make large hunts in order to gratify these tastes.

Hunting grounds.

Each family is supposed to own a portion of territory with the exclusive hunting rights to it. The territory is generally divided into three parts, each part being hunted over in successive years, and in this manner the fur-bearing animals are allowed to recuperate. In the southern country extensive fires, too close hunting, and other causes are rapidly exterminating the animals, and the families owning these grounds, in order to obtain a living, are obliged to encroach upon their northern neighbours. As the intruders care little or nothing about keeping up the stock on these lands, the result is most disastrous, and in a few years, if strict laws are not enacted, the fur-bearing animals of the province of Quebec will be practically exterminated, and the Indians, thus left without their only means of subsistence, will be reduced to beggary, or will die off from famine.

Extermination of fur-bearing animals.

Winter tent.

As soon as the hunting grounds are reached and the cold weather begins, the cotton tent is exchanged for the wigwam or "metswap," which is constructed by removing the snow from a circle ten or twelve feet in diameter, about the circumference of which poles six or eight inches apart are planted sloping inwards so as to form a skeleton cone. This cone is covered with cotton cloths, sheets of birch bark, or dressed deer skin, often in part by all three, and a space is left at the top about two feet in diameter for the escape of the smoke. The removal of a pole leaves the space for a door, which is generally closed with an old flour-sack split open, and bound to sticks at the ends to keep it spread out. The bottom of the tent is banked up with snow on the outside, while a thick bed of green boughs is laid over the floor. The fire is built on a few stones in the centre, raised slightly above the ground. Many of the southern Indians have small stoves made out of sheet-iron instead of open fires, and thus avoid the constant smoke which fills the interior, especially when the door is frequently opened.

Autumn hun

Before the lakes and streams freeze up, hunting is largely carried on with the gun, the Indians shooting from their canoes beaver, otter, mink and muskrats, and in the burnt areas, where blueberries are plentiful, bears. The northern Indians at this time are engaged in their principal caribou hunt, killing great numbers by spearing them in the rivers, as they pass on their annual migrations. After the rivers are frozen, most of the fur hunt is made with traps; these are either steel traps or dead-falls of wood.

Winter hunt.

The principal animals taken during the early winter are marten, fox and lynx. During the intense cold of December, January and February, the wild animals move about very little and hunting is unprofitable. During this period the Indians do not hunt unless compelled to do so by hunger.

Spring hunt.

In the month of March, the martens are once more travelling, and continue to constitute the principal hunt until the small streams begin to break up, when attention is given to the beaver and otter and, later on, to the bear. In this manner the winter routine is carried out, with the intervals mostly filled in looking for food. Ptarmigan and Canada grouse are killed during the winter, along with rabbits, which are periodically plentiful, while fish, ducks and geese aid in stocking the larder in the spring and fall.

Eskimo along the St. Lawrence.

When the St. Lawrence was first discovered, the Eskimo inhabited the north shore of the gulf as far west as Mingan. They maintained their position here until 1600, when the Indians, having procured firearms from the French, waged unequal war on their old enemies and drove them eastward to the Strait of Belle Isle, where the Eskimo maintained a fortified camp on an island near the western end of the strait until 1630. Since then, a gradual retreat has been made northward, and their present southern limit is Hamilton Inlet, which appears to have long been the head quarters of the southern Eskimo, and is named Eskimo Bay on all the older maps. From here these people are scattered along the northern coast to Hudson Strait.

Moravian Mission stations.

Several large settlements are found at the Moravian Mission stations of Hopedale, Zoar, Nain, Okak and Ramah on the Atlantic coast. There are very few families between Nachvak and George River in Ungava Bay, the coast being high, desolate and unfit to sustain a large population. The Eskimo are more numerous along the west coast of Ungava Bay and Hudson Strait, and are found along the east coast of Hudson Bay, and among the outer islands of that coast, as far south as Great Whale River. Of late years, some three or four families have hunted on the islands in James Bay.

Tribes of Eskimo.

Turner* divides the Eskimo inhabiting the coasts of the Labrador Peninsula into three or four sub-divisions, on account of sub-tribal dis-

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* Annual Report U. S. Bureau of Ethnology, 1889-90.—Ethnology of the Ungava District, Hudson Bay Territory, Lucien M. Turner.

tinctions maintained among themselves. The names given to these tribes, by Turner, are those used by the Eskimo of Ungava Bay. The first sub-division includes all those dwelling along the Atlantic coast and along the south shore of Hudson Strait to the mouth of the Leaf River, a few miles northward of the mouth of the Koksoak River. These people call themselves Suhinimyut, "those who dwell at or in the sun," or the dwellers in the east. The second sub-division embraces the Eskimo dwelling along the south shore of Hudson Strait, between Leaf River and Cape Wolstenholme, at the entrance to Hudson Bay. These people are called the Tahagmyut, "dwellers in the shade," or the western people. By the Hudson's Bay Company they are known as "Northerners." The third sub-division includes those living along the east coast of Hudson Bay, and they are designated the Itivimyut, or "the dwellers on the other side." A fourth division may be made of the Eskimo of the outer islands of Hudson Bay, who, according to the traders and missionaries, differ from their neighbours along the coast, both in language and customs. They are known as the Kigiktagmyut, or "Island people." Along the Atlantic coast, as far north as Hopedale, few or none of the Eskimo are pure blooded. To the northward the Moravian missionaries keep the natives from contact with the whites, and in consequence there are very few of mixed blood. In Ungava Bay and on Hudson Bay there are, around the Hudson's Bay posts, many half-breeds, the result of marriage between the employees and Eskimo women.

Improvement by missionaries.

The natives along the Atlantic coast, from Hopedale to Nachvak, have long been under the direct influence of the Moravian missionaries, and, in consequence, have abandoned many of their ancient customs. Polygamy is no longer tolerated among them; in many cases they conform with a fair standard of civilization, and are quite religious, although very superstitious.

On the coast of Hudson Bay, mainly through the endeavours of the Rev. Mr. Peck, of the Church Mission Society, most of the Eskimo have been converted to Christianity. On this coast the missionaries do not reside constantly among the natives, and in consequence these people are very liable to relapse, during their absence, into some of their former pagan habits. The Eskimo of Hudson Strait have not yet been brought under the influences of Christianity, and afford a better chance for the study of their native customs and traits.

Physique.

It is customary to think of the Eskimo as considerably below the stature of the average European. This is not the case with those inhabiting the coasts of Labrador. The males, as a rule, are quite as tall as the average white man, but owing to their broad, heavy build, they appear shorter than they really are; and this appearance is enhanced by their wide garments of hairy deer or seal skins. Where seen by the writer on Hudson Bay, and at Fort Chimo, George River, Nachvak, Davis Inlet and Hamilton Inlet, several of the men at each place were six feet and upwards in height, the average height being about five feet six inches. The women, as a rule, are short and stout, and look in their native dress of deer-skin coat, trousers and long seal boots, much shorter than they actually are.

Temperament.

The temperament of the Eskimo differs much from that of the Indian, the former being jovial, good-natured and very industrious. They are good workers with tools, and on the Hudson Bay coast the blacksmiths confess that the natives, without the use of a forge, can work and temper iron better than they can. These people, living as they do on the coast, depend largely upon marine animals for food and clothing. Their principal food is seal meat, together with porpoise, whale meat and fish. They also kill many caribou, to the north of the Koksoak River. For this purpose, they travel inland from the coast, but the pursuit of this animal is chiefly for its skin, used in clothing. The hunters quickly tire of the flesh, it being not fat enough to suit their taste. During the winter, they hunt fur, to purchase what supplies they may need from the traders. The principal furs taken by them are red, cross, black, white and blue foxes, white bears, wolves and wolverines, besides deer and seals. The Eskimo have not as many civilized wants as the Indians, the principal articles of trade taken in exchange for their furs being ammunition, tobacco, knives and iron, tea, sugar and needles. They do not buy much flour or biscuit, and very little European clothing.

Food.

Trade.

Habitations.

With the exception of the Atlantic coast Eskimo, who live about the mission stations in small log houses, the summer camp is made much like an Indian wigwam, save that it has a ridge-pole, and is covered with seal-skins. During the winter, small circular snow houses are used. For travel during the summer, two kinds of boats are used, the kaiak or men's boat is long and narrow, and formed of a wooden frame covered with seal-skins, leaving only a small circular opening large enough to admit the body of a man. The bow is long and pointed and projects above the water forward, the stern is fuller, and much lower and rounder. This craft is for one man, who propels it with a double-bladed paddle, and it is used for hunting. In these small boats the islanders of Hudson Bay frequently cross some fifty miles of open water to the mainland.

Boats.

The umiak or women's boat is much larger, and like the former is made from seal-skins stretched on a wooden frame. In shape and size it resembles a deep, flat-bottomed punt, and is capable of carrying the heavy seal-skin tent and all the other belongings of a family, when moving from one place to another. In winter, dogs and sleds are used to travel with, the Eskimo not being nearly as good a walker as the Indian. The sleds are made of two runners of wood, from nine to eighteen feet long, held in position, from eighteen to twenty-four inches apart, by numerous cross pieces. The sled is shod during the cold winter months with walrus ivory or whalebone attached to the runners with wooden pegs, or else the bottom of the runner is coated with vegetable mould, which is frozen on and then shaped with a knife or plane so as to resemble the head of a large T rail, both in shape and size. This is coated with a thin skin of ice and answers admirably during the cold unbroken winter. In the spring time, runners of hoop-iron are preferred. During the winter, cooking is carried on in the snow houses over soapstone lamps in the form of a shallow triangular dish, about fifteen inches long and eight inches wide. These dishes are nearly filled with seal oil, and the wick is formed of dry moss placed round the sides. Formerly soapstone kettles were used for cooking, but these are almost entirely superseded by tin or copper kettles purchased from the Hudson's Bay Company.

Sleds.

Cooking utensils.

Disease.

The habits of the uncivilized Eskimo are far from cleanly, and they appear to have a decided objection to the use of water except for drinking purposes. In consequence, the principal diseases from which they suffer arise from their filthy habits and the close vitiated atmosphere in their tightly closed houses, laden with the odours of decomposing animal food and other filth. Over half the Eskimo die of pulmonary troubles due to these causes and to exposure. Many suffer and die from scurvy, caused by devitalized blood and their excessively fatty food while remaining sedentary during the winter. As a rule, monogamy is practised, although many of the better hunters among the unchristianized natives have two and some three or four wives. The women are married early, generally at about fourteen or fifteen years and often before that age, and these early marriages result in few and weakly children. The marriage ceremony is very simple. The consent of the parents or other relatives of the girl is obtained by presents or favour, and, if the girl is favourable to the union, she goes with her husband. When the girl refuses, she is soon coerced by her relatives. The marriage tie is easily broken, and it is seldom that a man lives with a woman for a number of years. Jealousy, resulting from a laxity of morals or incompatibility of temper, dissolves the marriage without ceremony, the woman returning to her relations

Marriage.

until taken by another man. The family is usually of two or three children, although there are sometimes eight or ten, but many die in childhood. Like the Indians, the Eskimo never inflict corporal punishment on their children, who without it early learn, however, to obey and respect their elders. Children.

The dead are placed in a sitting position, with the knees drawn tightly up, and the whole body covered with seal-skin or deer-skin. The body is placed in this manner on the bare rock, and is covered with stones to prevent the birds and animals getting at it.

Like the Indians, they believe in a future state, where the spiritual conditions closely resemble those of the material world. As every object is endowed with a spirit, clothing, spears, gun, kaiak and other articles, are deposited near the grave, so that the departed may use the spirits of these articles, in his new existence separated from the body. The spirits of material objects are supposed to be released as soon as they decay and if they are found removed, it is said, that the spirit of the dead has taken them for use in the spiritual world. All objects animate or inanimate, have both a material and a spiritual existence; and there are other spirits, mostly of a malignant character, which can be appeased by gifts. Beliefs.

It is easy to understand that, holding such beliefs, they highly esteem, fear and respect the conjurers, whom they suppose to have power over the various spirits, including those that cause disease and death. The conjurers also claim to influence the movements of the deer and other animals, and are supposed to control the weather. Unlike the Indian conjurer, who performs his incantations concealed in a small tent, his Eskimo confrère invokes and exorcises the malignant spirits openly, or with only his head covered up. Some of the Eskimo while away the time during winter, by making rude carvings out of walrus tusk or bear teeth. The carvings represent various birds and animals, or models of their boats, sleds, or implements. Some of the carvings show considerable skill and artistic taste, especially those made under the direction of the Moravian missionaries. Conjurors. Art.

The Eskimo are very fond of singing, instrumental music and dancing, and readily learn to play the violin. At Hopedale and Nain the natives have orchestral music to accompany part singing in the church services, and many of the Eskimo of the Atlantic coast play second parts on the violin, showing that they have a fair idea of harmony. Music.

Fisheries.

In the appendices at the end of the present report will be found lists and short notes on the mammals, birds and fishes of the interior of the

Labrador Peninsula, and it remains only to remark here on the value of the inland fisheries. The numerous large lakes of the several watersheds, and most of the rivers, especially those flowing north and east, are stocked with an inexhaustible supply of food fishes of large size and superior quality, including among other species the lake and brook trout, land-locked and sea-run salmon, whitefish, pike, pickerel, suckers and ling or freshwater cod. Along the southern, eastern and northern coasts, the cod is taken in large quantities as far as Ungava Bay, which is the present limit where trial has been made for taking this fish. Salmon are found plentifully along the coasts as far as the west side of Ungava Bay, which appears to be the western limit of the Atlantic salmon. Very little is known officially or otherwise concerning the fisheries of that great inland sea, Hudson Bay, and a great amount of wealth may be lying dormant in its waters from lack of knowledge concerning its fisheries. As regards the inland fisheries, owing to the distance from available routes to a market, they will probably never be used to their full extent, and even the best situated lakes will not be fished for many years to come, or until railways are built through the interior. Three large lakes of the interior are known to contain considerable numbers of harbour seals (*Phoca vitulina*), which are completely land-locked, and never visit the ocean.

Food fishes of inland lakes.

Hudson Bay.

Detailed Description of Routes Explored.

Chamouchouan River.

Chamouchouan River.

The Chamouchouan River enters Lake St. John at its north-east corner. It is about three-quarters of a mile wide at its mouth, and is very shallow when the water of the lake is at its lowest stage, there being a difference of twenty-seven feet between the high and low water level of Lake St. John,* owing to its contracted discharges being unable to carry off the great volume of water brought down in the spring by the numerous large rivers emptying into it. The river, in its lower part, is obstructed by three large and several small islands, that extend upwards to St. Felicien, some eight miles from its mouth. Its current for this distance is sluggish, the river flowing between low banks of clay and alluvium. During high water the lake backs up to this point, flooding much of the low lands on either side.

At St. Félicien, there is a small rapid full of large boulders, and for five miles above, the current continues swift, to the first heavy rapid,

*Levels of Q. & L. St. J. Ry.—High water, 353 ft; low water, 326 ft. above sea-level at Quebec.

where a portage is necessary. This portage is 150 yards long, and passes over the bare rocks. Twelve hundred yards above, is the Salmon Portage, where the river falls over two cascades, the upper being a direct fall of fifteen feet.

Salmon River.

One mile above the portage, the Salmon River enters from the west. This stream is about fifty miles long, and takes its rise in a number of small lakes, near the sources of the Crôche and Windigo branches of the St. Maurice River.

The third portage is about seven miles above the second. Between them the river is about 500 yards wide and flows with a swift current, the banks, which have been gradually rising from St. Félicien, are now in places above 100 feet high, and are composed of clay overlain by stratified sand.

Bear Portages.

It is three miles and a half from the third portage to the Bear Portage, where there is a fall of fifty feet. This portage is on the east side, and is a mile and a quarter long. From its upper end to the Little Bear Portage, the distance is a mile and a half. Here, a rocky point jutting out from the east side, causes the river to make a sharp turn, with a fall of about twenty-five feet. The portage is 300 yards long and crosses the point.

Within the next two miles, there are two other portages on the east side, past heavy rapids, the whole bringing the river up nearly to a level with the surrounding country.

Sandy soil above the Bear Portage.

Beyond the last portages there are small rapids at intervals for a mile, then the river widens out to about a third of a mile, and flows with a strong, even current, in a shallow sandy channel, for seven miles, to the thirty-fourth mile from its mouth. Five large islands lie in this portion of the river. They are all low and sandy and are well wooded with swamp ash, elm, balsam poplar and willow. Along the lower parts of this course the banks are low, and the surrounding country flat, with a soil of sandy loam. As the other end is approached, the banks rise gradually, until at the sharp bend to the westward, one mile from the end, those on the east side rise abruptly over one hundred feet above the water, and are composed wholly of stratified sand. At this bend a portage-route passes up the steep bank to the flat sandy plain above, which it follows northward through several small lakes on the head-waters of Picouabi River. From there the route passes into Lake Jim, a long narrow body of water that extends northward in what appears to be an old river-valley, until it joins the Washimeska River, which, above the junction, flows in a continuation of this valley, while below it turns eastward, and with numerous rapids and falls empties into the Mistassini River.

After the westward course of one mile, before mentioned, the Chamouchouan River again turns north, and a series of long, heavy rapids begin, the lowest of which is called the Pimonka (last pine) Rapid.

The land on both sides of the river, as for as Pimonka, has been laid out into townships, and sub-divided by the Quebec government. The townships of Parent and Normandin are on the east side, while those of Ashouapmouchouan, Demeules and Dufferin are on the west side.

Good land along the lower river.

The soil along the lower parts of the river is very rich and strong, being formed of a clay sub-soil, with sandy loam on top. Above the Salmon River, the deposits of sand are thicker and the soil is lighter, but still sufficiently good to produce excellent crops of wheat and other cereals.

The Archæan highlands come within a mile of Lake St. John, on its west side. These continue northward, but do not cross the river until the foot of Pimonka Rapid is reached, thus leaving a wide margin of flat land on the west side. On the east side there is a flat clay and sand plain between the Chamouchouan and Mistassini rivers. This plain rises in a succession of terraces from Lake St. John northward.

Settlements.

Settlements extend up the west side of the river about five miles beyond Salmon River. On the east side, they approach close to the Bear Portage, while the road to Normandin, a large settlement along the Picouabi River, passes close to the Little Bear Portage. Advantage is taken of this road to transport canoes and outfit past the rapids and portages below.

From the above, it will be seen that, although considerable settlements exist along the river, there is much good land still unoccupied, especially between the Little Bear Portage and Pimonka Rapid.

Above this rapid, the character of the country and river change completely : the former, instead of spreading out into a flat, sandy plain, is high and rough, with rocky hills that rise from 150 to 300 feet above the river. These are covered with sand and boulder-clay, and are not nearly so fit for purposes of agriculture. The river becomes contracted and very rapid, rising 341 feet in twenty-two miles, including the Chaudière Fall and rapids, where the rise is 120 feet in less than a mile. The Pimonka Rapid is three-quarters of a mile long, and is followed in the next mile by two short ones. Extending from the thirty-ninth to the fortieth mile, is the Deep-bottom Rapid, which cannot be ascended with canoes during high water, owing to the depth inshore being greater than the length of the poles, and also to the steep rocky banks, which render tracking impossible. With the exception of one short rapid, there is quiet water from the head of that rapid to the forty-fourth mile.

At the forty-second mile, the Great Mouchipon River comes in from the west. It is a small stream, flowing in a valley about a mile wide, and draining a number of small lakes to the north-west. A portage route, for light canoes in the spring, passes up this river, and comes out above the Chaudière Fall, thus avoiding the heavy rapid between. From the forty-fourth mile to the Chaudière Fall, twelve miles above, the river is a continuous succession of rapids connected by short stretches of swift current, rendering it necessary to make the whole ascent with poles. At the White-spruce Rapid, near the forty-ninth mile, there is a short portage on the west side past a heavy pitch. Chaudière Fall.

The country becomes more rugged as the river is ascended. The hills rise abruptly from 200 to 400 feet above the water, and, as they were burnt over some years ago, their rocky sides are now only partly wooded with small second-growth aspen, white birch, Banksian pine and spruce, while the standing blackened trunks of the older forest give the whole region an uninviting, barren appearance. Timber.

The portage past the Chaudière Fall is nearly a mile long. From its lower end it rises sharply 200 feet to the summit of a sandy hill, and then runs along its edge, to within a short distance of its upper end, where it passes along the rocks near the river. There are here three distinct falls connected by heavy rapids, the lower fall having a sheer descent of sixty feet.

Within half a mile of the upper end of the portage, is another, about 400 yards long, called the Little Chaudière Portage. It passes a deep heavy rapid, impassable with canoes.

A short distance from the head of this portage, the river leaves the narrow rocky gorge in which it has been confined, and its valley broadens, leaving a wide margin of low land on either side. The course of the river can be seen up the valley for over ten miles. The river has a moderate current in a wide valley, bounded by low, rounded, rocky hills, covered with small second-growth timber. Much of the land in this valley appears fit for agriculture. Good land above the Chaudière Fall.

About one mile above the Little Chaudière Portage, the Chegobich River comes in from the westward. This river is much used as a route by the Indians who travel to or beyond Lake Ashouapmouchouan. By it the distance to that lake is greatly shortened, as this route is the hypothenuse of a right-angled triangle, of which the main river forms the other two sides. Chegobich River.

The Chegobich River varies from fifty to one hundred yards in width near its mouth, and is quite shallow. As far as the first portage, a mile and a half up, the banks are low, and are composed of coarse boulder-clay. The first portage is one hundred and twenty yards long, and passes a heavy rapid; it is followed, a quarter of a mile above, by a second portage, over one mile long, past another heavy rapid, ending in a chute of forty feet. Then follows a mile and a quarter of swift water, with two short portages, to the Penché Portage, 700 yards long, with the Savanne Portage, of 200 yards, a half mile above. Beyond this there are stretches of sluggish water, broken by small rapids for four miles, when a portage of 300 yards passes a chute of twenty-five feet.

From the first portage to beyond Savanne Portage, the country surrounding the river is rolling and somewhat rocky, with small second-growth forest covering it. Beyond the Savanne Portage, the banks are low and sandy, with swampy land extending to the low hills that bound the valley on either side, from half a mile to a mile away from the river. Patches of old forest remain on the swampy land, but by far the greater part is small second-growth trees.

Above the chute, the river for nine miles winds through a wide, swampy valley, its sluggish current being broken only in a few places by short rapids. In this distance a number of small tributaries enter, chiefly from the south-west, where they take their rise in numerous lakes on the eastern slope of the Partridge Mountains. These form a ridge of rounded hills, that appears to run nearly north-and-south and to cross the river near Chegobich Lake.

The river, having now become very small, is inclosed in a narrow valley between rocky hills that rise from one hundred to three hundred feet above it, and in the next two miles to the lake it is much broken by rapids, filled with large boulders, entailing several short portages.

Chegobich Lake.

Chegobich Lake runs northward for nine miles from its discharge; it then turns sharply to the eastward, and extends in that direction some fifteen or twenty miles. The general width of the southern arm is about one mile. It is said to be very deep and the water is clear and brownish. Only three small rocky islands are found in the southern arm. The lake is surrounded by low rounded hills, highest on the east side, where they culminate in Chegobich Mountain, a bold rounded hill rising 420 feet above the water near the outlet, and forming a conspicuous landmark. The other hills on this side never exceed an elevation of 350 feet, while on the west side they are less than 200 feet. There was more unburnt timber about this lake than had been seen anywhere along the route from Lake St. John; but it is not large, and is chiefly black spruce. From the angle between the two arms of the lake, a portage a mile and a half long, passes westward over a flat, dry, sandy plain, and ends at a small sluggish stream. This stream has a very tortuous course through a wide swamp. After passing two small lakes, it finally flows into the south-east end of Lake Ashouapmouchouan, two miles and a half from the portage in a straight line, but over seven miles by the crooked course of the river. A few low, rounded hills of gneiss rise out of the swamp, but, apart from these, there is very little solid land, where small black spruce, larch and Banksian pine are found growing.

Lake Ashouapmouchouan is about six miles long with an average breadth of one mile. Its shore-line is broken by a number of rocky points and shallow bays, while the surrounding country, as a rule, is low and flat, with a few ridges, never more than a hundred feet above the level of the lake, which, according to Richardson, is 1184 feet above the sea. The water is not nearly so deep or clear as that of Chegobich Lake. The surrounding country seems to be highly fertile, and in the clearings about the old Hudson's Bay post timothy grass grows in abundance, while small fruits appear to ripen early.

Lake Ashouapmouchouan.

The Chamouchouan River, above here called the Nikaubau River, flows in at the north-west angle of the lake, and about a mile beyond leaves it again at the north-east corner. The northern part of the lake is silted up with material brought down and deposited by the river, and is a favourite place for nets, great quantities of fine white-fish being caught there.

Nikaubau River.

Above the lake, the Nikaubau River for several miles, to the Pole Rapid, flows with a sluggish current through a low country broken by a few rocky hills. Above the rapid, the land becomes higher and the soil, composed of boulder-clay, rises from twenty to eighty feet above the river, and is broken by an occasional rocky ridge sometimes 200 or 300 feet high. Little Nikaubau Lake is about twelve miles above Pole Rapid portage, and between are a number of short heavy rapids, with a short portage past one of them. This lake is one mile across, and is connected by a couple of lake-expansions of the river with the larger lake three miles above. Lake Nikaubau is four miles long, and from a half to one and a half miles broad. It is surrounded by low and apparently swampy country covered with a medium growth of spruce, larch, balsam fir, Banksian pine, aspen, balsam poplar, and white birch, with a few small cedars. It may here be noted that the ravages of the imported larch saw-fly *(Nematus Erichsonii,* Hartig.) extend to the height-of-land; the greater part of the larch trees have been attacked, and large numbers are already dead. It is learned from the Indians that these trees first showed signs of death

Timber.

north of Lake St. John, some three or four years ago. The trees north of Lake Mistassini still remain unattacked, but it appears to be only a matter of time before all the larch of Labrador will be destroyed, as the pest is spreading rapidly northward.

The Foam-fall River is the largest stream entering Lake Nikaubau; it flows from the south-west, and enters the lake near its outlet at the south end. There is a route by this river to the head-waters of the St. Maurice River, which was surveyed by Richardson.

Country about height-of-land.

A small stream, flowing into the north end of the lake, leads by a chain of six little lakes to the watershed between the St. Lawrence and Hudson Bay. From Lake Nikaubau it is twenty-four miles to the head of the stream and the surrounding country is flat, low and swampy. One hill about 500 feet above the general level, lies close to the watershed and forms a conspicuous landmark.

Short stiff rapids are met with along the stream between the lakes. At the fourth or Branch Lake, the river divides, the larger branch flowing in from the north-east, where it is said to drain a number of small lakes immediately south of Lake Wahwanichi. Owing to numerous rapids and other obstructions it is unused as a canoe route.

Height-of-Land to Lake Mistassini.

The general course of the route from Lake St. John to the height-of-land is about north-west, while the distance is nearly one hundred and sixty miles. From the watershed to Lake Mistassini the general direction is nearly N. 30° E., or almost at right-angles to the former course, the distance being about one hundred and ten miles. On crossing the height-of-land the route passes through three large lakes before reaching Mistassini. These lakes are named Obatogaman, Chibougamoo and Wahwanichi, and they are connected with one another by portage-routes passing through small lakes and the streams flowing from them.

Elevation at watershed.

The height-of-land, according to Richardson, is here 1360 feet above sea-level. It is crossed by a portage of half a mile, ending at a small stream that flows into Lake Obatogaman, five miles distant. The fall to the lake is one hundred and fifty feet. The surrounding country is uneven and sandy, and supports only a small growth of black spruce and birch.

Lake Obatoagman.

Lake Obatogaman is very irregular in outline, being broken up into a number of deep bays by long narrow points; its surface is also crowded with innumerable small rocky islands to such a degree that navigation without a guide is almost impossible. The lake is estimated to be about twelve miles long from north-east to south-west, and about ten miles broad. Its shore-line must considerably exceed one hundred miles in length, owing to the great irregularity in its shape. The water is not very clear, and as a rule appears to be shallow. The outlet is in the south-western part of the lake, and forms a branch of the Nottoway River, which empties into Rupert Bay, the south-western extension of James Bay. Whitefish, pike, pickerel and suckers are caught in abundance here, and sturgeon are also said to ascend to the lake, and are taken at certain seasons in large numbers near the outlet.

Fish.

The surrounding country, except toward the south, is generally flat and low, with ridges of low granite hills rising above the general swampy lands. The soil is thin and sandy and the timber small along the shore and on the islands. It consists chiefly of black spruce, along with balsam fir, white birch, Banksian pine and larch. The canoe route crosses the lake in a north-west direction for ten miles, between islands and past long points, to a narrow bay, which is followed north-east four miles to the first portage on the route to Lake Chibougamoo.

Character of country.

The portage-route is nine miles long, and first passes up a small stream falling into the head of the bay. Along this stream three portages are made past rapids, and then a portage leads from the small swampy lake at its head, to another small lake which discharges into Lake Chibougamoo. Following this sluggish stream four miles, through a swampy country with low hills of rock rising at intervals, the south-west bay is reached. Along the portage-route most of the timber has been burnt off, leaving only clumps of black spruce and larch growing on the lower swampy ground. The level of Lake Chibougamoo is forty feet above that of Obatogaman. Its greatest length is about twenty-five miles, from N. 30° E. to S. 30° W., and it is over six miles wide in the broadest part. The southern end is divided into two bays by a narrow point, three miles and a half long. A high rocky ridge projects twelve miles from the northern end, dividing that portion of the lake also into two bays, of which the eastern is the larger, being about twelve miles deep and four miles broad. The western bay is seven miles long, and is very irregular in width, being a succession of small lakes connected by narrows. The lake has on its western side two outlets, about three miles apart. The northern one is near the mouth of the north-eastern bay. They are both only about 200 yards long, and the water falls twenty-five feet into another lake lying parallel to Chibougamoo, and separated from

Timber.

Lake Chibougamoo.

it only by a narrow rocky ridge. This smaller lake is twelve miles long, and from one to two miles wide. The lake is well stocked with large lake trout and whitefish, and its water is very clear and deep. From it flows another branch of the Nottoway River, which unites with one from Obatogaman some considerable distance to the south-west.

Character of country about Lake Chibougamoo.

Lake Chibougamoo is studded with numerous low rocky islands, especially along its eastern side and in the north-east bay; a few are also scattered up the western half, as an apparent extension of the ridge forming the southern point. The shores of the lake are low, and are either formed of solid rock or of large rounded boulders, often found piled up in low walls by the action of the lake ice. The land rises gently from the eastern side to the height-of-land some eight or ten miles distant.

Hills.

The ridge between the two lakes, on the west side, is low in its southern part, but between the two discharges rises to a height of 250 feet, in a bare rocky hill, called Paint Mountain, from the rusty colour of the rocks, due to the decomposition of iron-pyrites in them. The north-west bay is surrounded by high rocky hills, arranged in sharp ridges parallel to the direction of the lake. These culminate in the Sorcerer and Juggler mountains. The former is situated near the end of the point between the two northern bays, and is estimated to rise 425 feet above the water; the latter lies a short distance to the north of the head of the north-west bay; it appears to be somewhat higher than the other, and ends in a sharp cone, having perpendicular sides fifty feet high, and is probably composed of massive diorite. From its resemblance to the tents used by the Indian conjurors, it has been called the "juggler's house," and is supposed to be the dwelling place of evil spirits. The outline of the hills in this locality is sharply serrated, in marked contrast to the rounded outline usually seen in the Laurentian hills. This difference is probably due to the nature of the rocks forming the hills, which are chiefly a soft, green chlorite or altered hornblende schist easily affected by the weather. The timber about the lake is larger and better than at Lake Obatogaman. Black spruce predominate; white spruce, balsam fir, larch and Banksian pine also occur, together with medium-sized birch, aspen, and a few cedars. The higher country at the north end has been mostly burnt over, and is covered with small second-growth aspen, birch and Banksian pine.

Timber.

From Lake Chibougamoo to Lake Wahwanichi, the distance is four miles, the portage-route passing from the head of the north-west bay up, over a burnt hill about 300 feet, to a small lake, and thence through three other small lakes, by intervening portages, to Lake Wahwanichi, which is about 200 feet higher than Lake Chibougamoo. The country passed through by the portage-route is rough and rocky, and, as all the green wood has been burnt off, it presents a very barren appearance. Lake Wahwanichi lies parallel to Lake Chibougamoo. It is twenty-four miles long, while its breadth varies from half a mile to four miles, with an average of one mile. The south-west end is divided into a number of long parallel bays by narrow rocky ridges, which rise from fifty to 200 feet above the surface of the lake. There are three of these bays on the western side, and one on the east side. The former are all about four miles deep, and vary from a quarter to half a mile in width ; the eastern one is nearly six miles long. From the mouths of these bays, the main body of the lake to the northward is less than a mile wide, for five miles, when it gradually expands and is divided into two bays by a low narrow neck of land connecting a rocky peninsula with the mainland. The north-west bay is some three miles deep, and its head is only a few miles from one of the southern bays of Lake Mistassini. In winter the route between these lakes passes up this bay, and thence a short distance over low hills to the valley of a small stream falling into the Mistassini. The north-east bay is deep, and narrows to less than a quarter of a mile at its head, where the discharge flows out towards Lake Mistassini. Towards its southern end, the lake appears to be shallow, but in the narrows and northern part it is quite deep. There are only four or five small islands on the lake. Its water is clear and cool, and it abounds with fine whitefish and lake trout. In its northern part the inhabitants of the Hudson's Bay Company post at Mistassini make their fall fishery, and take in nets an immense quantity of lake trout averaging six pounds in weight. On the north-east side of the lake, the country rises gradually some 300 feet to the height-of-land, which skirts that side of the lake at a distance of from three to six miles. In only a few places along this shore is the bare rock seen, the soil being made up of thick layers of fine glacial drift, composed largely of débris of the limestone found to the northward about Lake Mistassini. This forms an excellent soil, as can be judged from the number of large trees upon it. The south-west side of the lake is more rocky. At its southern end and along the narrows, the rocky shores rise abruptly from fifty to 200 feet above the surface of the lake. The shores of the north-west bay are low, but the western side of the north-east bay is high and rocky, rising near the outlet 350 feet above the water.

Lake Wahwanichi.

Fish.

Excellent soil.

Much of the country surrounding the lake has been burnt. What remains of the old forest, as already stated, is of good size, and trees

Timber.

eighteen inches in diameter three feet from the ground, are not uncommon, while the general average is larger than that of any district seen northward of Lake Ashouapmouchouan. Black spruce, white spruce, balsam fir, larch, Banksian pine, white birch and aspen grow abundantly on the unburnt tracts along the eastern shore, and cedar of medium size is found close to the edge of the water.

Lake Wahwanichi discharges into the south-west bay of Lake Mistassini by a small stream four miles long. In this distance there are a number of small lake-expansions connected by rapids and falls, to pass which three short portages are necessary, the total fall being sixty feet. The height-of-land passes close to the river on the south side, while the country is slightly broken to the north.

Lake Mistassini.

Early narratives.

Lake Mistassini is the largest and by far the best known lake of the Labrador Peninsula. Tales regarding its great size were told by the Indians of the lower St. Lawrence to the earlier pioneers, and the first explorers of the region brought back exaggerated accounts of the extent of the lake, derived from like sources of information and not from actual observation. Quite recently similar stories excited the imaginations of various writers in the public press, and numerous speculations were indulged in regarding the magnitude of this mysterious body of water, which, by some, was held to be even greater than Lake Superior. When at last a survey of the lake was completed in 1885, there remained some persons who refused to give up their belief in its supposed great size, asserting that only a bay had been surveyed and that the lake stretched out indefinitely beyond, far to the northward, notwithstanding the fact that branches of the East Main River rise a short distance northward, and that other branches extend to the eastward, over two hundred miles beyond the northern end of the lake.

Survey.

Position.

Although Lake Mistassini does not reach the size ascribed to it by many, it is still a very large body of water, situated between latitude 50° and 51° 24' N., and longitude 72° 45' and 74° 20' W. A straight line drawn from the south to the north end of the lake would run about N. 30° E. The lake itself has a perceptible curve between its ends, with the concavity of the curve towards the south-east ; the shore-line nearly coincides with an arc of a circle, so that the general trend of the lake changes gradually from north in the southern portion until at the northern end its direction is north-east. The greatest length in a straight line, between the heads of the north-east and

Size.

south-west bays, is roughly one hundred miles; the average breadth of the main body is twelve miles, and it varies but little from that measurement. A low, narrow, rocky point extends out from both the north and south ends of the lake, dividing each end into two deep bays. Between the points, and formed by the same rocky ridge, there is a continuous chain of low islands; these overlap one another, so that only in a few places along the shore is a view of the opposite side obtained. A slight lowering of the present level of the lake would connect these islands and points, so as to form two lakes, as the water between the islands is quite shallow, in marked contrast to the depth between the islands and the mainland on either side. There the depth averages over 300 feet, but in some places exceeds 400 feet. The water is very clear, and the temperature of the main body rarely if ever rises above 50° Fahr. Islands.

The south-east bay is called Abatagush. It is three miles wide at its mouth, and from there gradually lessens for six miles to the Big Narrows (Chabatok), where, for about a quarter of a mile, it is not over two hundred yards wide. Again expanding to an average breadth of nearly two miles, it extends to the south for eleven miles, where it is subdivided into two arms by a long narrow point. Bays.

The eastern arm, called Cabistachuan Bay, averages a mile and a half in breadth, and runs south nine miles, and then east four miles to its head, where a portage leads to the Little Perch River. This stream drains a number of small lakes to the south-east, and is used as a route to the head-waters of the Chief River, the main branch of the Chamouchouan.

The western arm is larger and more irregular than Cabistachuan Bay. From the end of the dividing point, where it is two miles wide, it gradually narrows for four miles, so that along the last half-mile it is only about fifty yards across; this part is called the Little Narrows. Passing the narrows, the bay expands to one mile in width and runs a few degrees east of south for five miles; then it widens out to four miles, and continues on the same course eight miles further, to the discharge of Lake Wahwanichi that comes in at its head. Where the bay widens, there is on the western side, an arm called Sassikan Bay, that runs due north four miles, and is nearly parallel to the main body. Four miles from the head of the bay, a narrow point stretches out three miles from the eastern shore, and almost meets a shorter point from the western side, leaving only a narrow channel between. This point is called Eliquabit, and on it was situated the old King's Post of the North-west Company. The Hudson's Bay Company's post is established on the east side, just inside the Little Narrows. Trading posts.

The south-west or Poonichuan Bay, for a distance of twenty miles from its entrance, has an average breadth of five miles, and its shore-line is broken by a number of smaller bays, from one of which a portage of two miles leads to Abatagush Bay, reaching it near the Hudson's Bay post. This portage is much used, as it obviates a canoe trip of nearly fifty miles, around the point to the spawning grounds in Poonichuan Bay, where immense quantities of whitefish are taken in nets during the spawning season in October. After the first twenty miles the bay narrows to less than half a mile, and extends in a south-west course for over fourteen miles, a small river coming in at its head.

Fisheries.

The bays at the north end of the lake are not so deep as the southern ones. The distance from the end of the point to the head of the north-west bay is fifteen miles, and its average breadth is rather more than four miles. The north-east bay extends nineteen miles from the same point to its head, and has an average breadth of four miles.

Besides the great bays already described, many smaller ones indent the shores of the lake, especially on its west side, where the coast-line is very irregular and many islands occur.

Character of shore-line.

As a rule, the shore is rocky, with only a steep, narrow bouldery beach, and moderately deep water close in. On the east side, the shores and islands are formed of limestone, that dips at a low angle towards the south-east ; consequently, beaches facing in that direction shelve gradually into deep water, while those with a western aspect are generally cut off perpendicularly with deep water close up to them. On the west side of the lake, the limestone is only found on the outer islands and points, where similar conditions exist, but the greater part of the shore-line here, being formed of gneiss, perpendicular faces are wanting and the slope is more even in all directions. In some places no rock is seen, and then the beaches of the islands and mainland are formed of boulders, often piled up by ice in low ridges close to high-water mark.

Surrounding country.

As before stated, the escarpment forming the height-of-land passes close to the southern end of the lake, and continues on in a north-easterly direction at an angle to the trend of the lake, so that it is soon a considerable distance to the eastward as it is followed towards the north. The general height of the escarpment appears to be about 300 feet above the lake, but some points may rise to 500 feet. The only other elevation of any consequence, is a range of hills that lies about five miles beyond the north end of the lake, and from there appears to trend away to the westward. Its highest point is not over 500 feet. There is also a limestone ridge running along the eastern side of the lake which seldom or never rises 100 feet above the water, but often presents a perpendicular face. This ridge separates Lake Mistassini from Lake Mistassinis. On the west side, the country is generally low and swampy, being broken by rounded gneiss hills, never over 100 feet high, and generally less than 50 feet.

The principal rivers flowing into Lake Mistassini, are named the Temiscamie, Papaskwasati, Tokwaoio and Wabassinon. The Temiscamie River is the discharge of Lake Mistassinis, and is the largest stream entering the lake, coming in on the east side, about twenty miles from the north end. It is only two miles long, and as the difference of level between the two lakes is 55 feet, the river descends in a continuous heavy rapid, through a shallow limestone gorge. The Papaskwasati and Tokwaoio rivers are large streams flowing into the heads of the north-west and north-east bays respectively. Both come from the northward, and rise near the head-waters of the Tichagami Branch of the East Main River. A canoe route to Nichicun is said to pass up the Tokwaoio River, and to cross from its head to the East Main River. The Wabissinon River is a smaller stream flowing into the lake on the west side, nearly opposite the mouth of the Temiscamie River, and draining an area of country to the north-west of the lake. Besides these larger rivers, there are numerous smaller streams that rise in lakes and swamps in the surrounding region; notably the discharge of Lake Wahwanichi and the Little Perch River, both flowing into the southern part of Abatagush Bay. Rivers.

The soil of the region about Lake Mistassini is made up of boulder-clay, derived from the disintegration of the neighbouring rocks. Large Laurentian and Huronian boulders, with blocks of limestone, are scattered about in profusion. The finer material of the soil is sandy clay, with a large percentage of finely divided and intimately mixed limestone, especially about the southern and eastern shores of the lake. Good Soil

The climate of the country surrounding Mistassini is such as to preclude the possibility of its ever becoming an important agricultural region, chiefly owing to the prevalence of summer frosts. At the Hudson's Bay post, a most favourable locality, the average temperature of the three warmest months is about 60° Fahr., but, unfortunately, no summer passes without severe frosts in June and August, which cause great damage to the potato crop grown there. Climate.

Snow covers the ground from the middle of October, and remains until the middle of May, all the smaller lakes being frozen over during that period. Owing to its great depth and consequent slow change of temperature, the main body of the lake rarely freezes over before the 20th of December, and it breaks up a couple of weeks later than the smaller lakes and bays in the spring. From the same cause, the general summer temperature of the region surrounding the main lake is lower than that about the post, and even in the month of July, in the swampy lands adjacent, the soil is frozen solid within a few inches of the surface.

Timber.

Covering the higher ground towards the southern end, white and black spruce, balsam fir, Banksian pine, aspen and white birch are found, some trees having a diameter of eighteen inches three feet from the ground. Similar trees of smaller size are found along the limestone ridge on the eastern side. On the western side, where the Archæan rocks occur, the soil is scant and sandy, and, in consequence, the trees are much smaller. They are chiefly black spruce and larch, along with small Banksian pine, balsam fir, aspen and white birch. Black spruce and larch alone grow in the swamps, and also form a fringe along the shores and islands of the main body of the lake, where the sweep of cold winds probably interferes with the growth of other species. Cedar reaches its northern limit at the southern end of the lake, where only a few stunted trees are seen.

Fish.

Fish of various kinds and of large size are caught in abundance throughout Lake Mistassini. Lake trout are taken weighing from four to forty pounds, brook trout up to six pounds, whitefish to fourteen pounds, and pike, pickerel, red and white suckers and chub of correspondingly large size. These fisheries would prove of great value if access to them could be had by railway, as the supply is practically unlimited here and in the adjoining large lakes.

Animals.

Caribou and moose, once plentiful in the region, are almost extinct, and can no longer be relied on as a source of food by the Indians, who now live wholly on fish, rabbits and the fur-bearing animals. Of these beaver and bear are the most plentiful, the former being still found in considerable numbers in the small lakes and streams tributary to the lake. Black bears are common on the extensive areas of burnt land on all sides of the lake, but most especially to the south-west. Besides these, marten, mink, fisher, otter, lynx and foxes are taken in large numbers, the fur of the marten being particularly dark and valuable.

Indians.

There are about twenty-five families of Indians belonging to this post. Very few are now pure-blooded, being mixed with the whites, who have traded in the region for the past one hundred and fifty years. In the spring all the able-bodied men are employed in the large bark canoes that descend the Rupert River to James Bay with the hunt of the previous winter, returning with the outfit of goods and provisions for the coming year. The canoes depart about June 20th, and return about August 20th. As nearly all the women and children accompany the large canoes in their own small craft, very few persons remain about the post during the summer, and as a consequence parties from the outside find it impossible to obtain guides or other assistance there during that period. Those who remain live altogether on the fish caught from day to day, as only sufficient provisions are brought in to supply the post during the winter and to provide for the men engaged transporting the furs to Rupert House. From these causes, the exploration of central Labrador is attended with many difficulties, especially as the country cannot be depended on to supply any food during the summer months, and consequently provisions to last the entire season must be brought in from the coast, up very rough and rapid rivers at great cost and loss of time.

Lake Mistassinis, as before stated, lies to the eastward of Lake Mistassini, from which it is separated by a ridge of limestone varying from two to six miles in width. Lake Mistassinis.

The difference in level between the two lakes is fifty-five feet. The smaller lake is about sixty miles long, extending from opposite the north end of Mistassini to a place east of the Big Narrows. In its northern part, the lake is about six miles wide and is free from islands or bays, but south of the discharge it narrows considerably and splits up into a number of deep bays, while its surface is covered by numerous low islands. These are formed from limestone reefs running parallel to the direction of the lake, and are most numerous about the outlet and between there and the Temiscamie River which flows in on the east side some three miles south of the outlet.

The water of the lake between the rivers is brownish and not clear, in consequence of the impurities brought down by the river. In other parts the water is clear, deep and cool. Large fish, of the same species as those taken in the great lake, are also abundant here. Fish.

The land on the west side of the lake is low, with rocky shores of flat limestone. The country to the eastward is higher, and consists of a plateau formed of limestone, which separates the lake from the Temiscamie River. The face of the plateau fronting the lake is steep, and has in places a perpendicular cliff of limestone rising from 50 to 200 feet above the water.

The hills mentioned as bounding the north end of Lake Mistassini, also extend part way across the north end of this lake, with an interval of low ground to the north-east, where a portage of less than two miles crosses to the Temiscamie River. This river is the only important one falling into the lake. It takes its rise to the north-eastward along the northern side of the watershed separating it from the head-waters of the Mistassini and Peribonka rivers flowing into Lake St. John. It passes through Lake Temiscamie, a large body of water near the height-of-land, and then flows south-west twenty miles, to within a short distance of the head of Lake Mistassinis, when, instead of entering the lake, it keeps to the eastward of the limestone ridge already mentioned and flows within a short distance of and parallel to the lake for nearly twenty-five miles, where it falls into a small bay on the east side.

The climate, soil and timber of the country surrounding Lake Mistassinis are similar to those of the eastern side of Lake Mistassini.

Lake Mistassini to the East Main River.

Rupert River.

From Lake Mistassini, the route to the East Main River first descends a branch of the Rupert River for fifty miles almost due north, and then leaving that stream passes north-westward, through a number of small lakes, to and down a small tributary into the East Main River. The distance between the two rivers is fifty-eight miles.

Contracted discharge of Lake Mistassini.

The Rupert River forms the discharge of Lake Mistassini. It leaves the lake on its west side, thirty-five miles from the head of the North-west bay. The outlet is at the bottom of a small bay, where the river flows out, over a ledge of gneiss, forming a small rapid. Here the stream is not over one hundred yards wide, and is hemmed in by rocky banks. This contracted discharge is insufficient to carry off the waters poured into the lake by the numerous large rivers previously mentioned, and as a consequence the level of the lake rises during the spring, and reaches its highest level about July 15th, after which the water slowly subsides. The period of lowest level is about the middle of May, or just before the spring freshets, so that the lake rises much more rapidly than it falls, making the volume of water in the Rupert very constant in comparison with that of other rivers flowing into Hudson Bay. On leaving the lake, the river flows almost on a level with the surface of the surrounding country, widening out into deep bays and separated into numerous channels by low rocky islands. For the first eight miles of its course, it flows south-west, or roughly parallel to the shore of the lake, and so close to it that at the end of the distance a portage of less than 200 yards leads from a bay in the lake to the river. Below this portage for two miles, the river continues between rocky banks, with a swift current, and then flows out into a lake-expansion extending westward more than ten miles, and varying from one to three miles in breadth.

The river flows out of this lake by two main and several smaller channels separated by large rocky islands. The two main channels are soon joined by the smaller ones, and then form large rivers, separated from each other by a very large island, and not uniting again for over 100 miles.

Two channels.

The western channel is followed by the Hudson's Bay Company's brigade in going down to Rupert House. This channel is descended in a north-west direction about fifty miles, where the route passes from the western end of an expansion called Lake Miskittenau into a chain of lakes on the Marten River, a small branch which joins the Rupert over 100 miles below.

Islands in Rupert River.

The eastern channel forms part of the route to the East Main River. It runs comparatively straight for fifty miles, having a general course a few degrees east of north, and leaving the above-mentioned lake-expansion at its eastern end, by a number of channels on its northern side. For five miles it is obstructed by innumerable small rocky islands, and is so deeply indented with bays, that were it not for the strong current the stream could not be easily followed. Near the end of this distance the river narrows to a general width of less than a quarter of a mile and passes over two small rapids between islands. For the next five miles the average breadth of the river is 300 yards, and it flows with a steady, swift current to a small rapid, below which the breadth increases to nearly half a mile, and continues so for two miles to a heavy rapid, that falls twenty feet in 200 yards.

The portage past this rapid is a quarter of a mile long, and runs on the summit of a ridge of boulder-clay. The crest of the hill is about 150 feet above the water, and is so narrow and sharp that there is only room for the portage-road on it.

Pinched-neck Lake.

Below the portage the river is about 300 yards wide for five miles and a half, with a strong current and numerous islands. It then expands to an average width of half a mile, and is quite deep, with a sluggish current. These conditions continue for seven miles, when, turning sharply westward, the channel contracts and the stream falls twenty-five feet, over a chute, into the head of Kachikakakuaiats or Pinched-neck Lake. This lake extends north-westward ten miles, and in its widest part is about two miles and a half across. The river flows out on the west side five miles from the inlet, and thence runs in a westerly direction to join the other main branch, some fifty miles farther down.

From Lake Mistassini to the first portage, the country surrounding the river is very flat, with no hills over 150 feet high. The river appears to have no channel proper, merely filling the depressions and fol-

Character of country along Rupert River.

lowing the general slope of the country. The islands, shores, and a greater part of the high land are rocky. The depressions where they are not occupied by swamps, appear to be filled with broken rock and boulders, while the finer material of the drift has to a great extent been carried away, not enough remaining in many places to fill the interstices between the heaped-up boulders. The boulders and broken rock are also profusely scattered over the rocky hills and in the river-bed. What soil remains is poor, thin and sandy, supporting only a scant stunted forest growth of black spruce, larch, aspen, and white birch. These trees never exceed forty feet in height, or ten inches in diameter. The underbrush in the low-lying portions is "laurel" *(Kalmia glauca)* and Labrador tea *(Ledum latifolium)* while the higher ground is covered with white reindeer moss. The growth of trees in this region is exceedingly slow, as may be seen from the length of time required to cover areas burnt over years ago, and where now only a scattered growth of black spruce and Banksian pine is springing up.

Timber.

Burnt country.

Below the first portage, the river flows in a valley cut transversely through several ridges that appear to run east-north-east and west-south-west. These hills, as the river is descended, rise gradually from 100 feet to 400 feet in the neighbourhood of Pinched-neck Lake, where they occupy both sides of the lake. Along this lower part of the river more than half the country has been burnt over, thus removing all the trees and vegetable soil, and leaving only the bare rock and scattered boulders, giving to the region a very barren, desolate appearance.

Portage-route between Rupert and East Main rivers.

The portage-route between the Rupert and East Main rivers leaves Pinched-neck Lake at its western end, and there passes, two miles up a small stream through four small lakes (1, 2, 3, 4) connected by short portages. Then a portage of 200 yards leads to lake No. 5. This is one mile long, and is connected by a portage of 500 yards with a larger lake No. 6, which drains into another small branch of the Rupert. This lake is full of small islands and has numerous little bays. It is followed three miles and a half northward to its discharge, where a great mass of boulders, 200 feet wide, separates it from lake No. 7. The outlet of this last lake is close to the inlet, and is said to flow westward through a chain of small lakes to the Rupert River.

Passing northward for a mile and a half, the route then turns westward for one mile, into a bay, and then northward again three-quarters of a mile, to a portage of 800 yards which leads to lake No. 9, which is about a mile long and three-quarters of a mile wide. It crosses this lake to another portage of 800 yards through a swamp, ending in a slightly larger lake, No. 10, which is followed N. N.E. one mile and a quarter to its head, where a portage of 400 yards passes over a boulder-ridge 200 feet high, and ends in a broad shallow stream. Another branch of the Rupert River, which is one mile and a half to the eastward, flows out of a large lake, No. 11. The western end of this lake is crossed, and a short portage made along a small stream flowing into it. This stream is followed northward about two miles and then turns directly west for another two miles, where two short portages, with a pond between, lead to lake No. 12. This lake is followed north-west for two miles, when a portage of 200 yards is made to lake No. 13, at the head of the Kawachagami or Clearwater River, a small branch of the East Main River. Following this lake two miles to its outlet, a portage of half a mile ends at the head of the eastern bay of Clearwater Lake.

This lake is roughly triangular in shape, having east, west, and north bays, with minor ones. Its water is brownish, clear, and moderately deep. Islands are numerous especially at the end of the north bay, where the shore-line is rocky and irregular. From east to west the lake measures about seven miles, and about three miles and a half from north to south. Two small lakes with narrows between, lead from the north-east corner of the north bay, to a long lake lying to the westward, about four miles from Clearwater Lake. The outlet is on the east side of the north bay. It is very small and narrow, and as it turns off at right-angles to the direction of the bay, cannot be seen until entered. Clearwater Lake.

Leaving the lake by the outlet, the river flows directly east for two miles and a half; then it bends sharply to the north-west, around a long narrow point and enters a small lake. Following this lake northward for two miles, a short portage is made past a small rapid at its discharge, after which the course is west, for two miles and a half, through a small lake-expansion to another short portage past a fall of eight feet.

The river thence flows northward in a shallow, sandy channel for four miles to another small lake, a mile and a half long, with a rapid at its outlet. The river, now about twenty yards wide, flows with a sluggish current in a very crooked channel through an extensive swamp, until it empties into Tide Lake on the East Main River. The distance between the last two lakes in a straight line is five miles, while by the river it is considerably more than double that; the general course is W. N. W.

From Pinched-neck Lake to Clearwater Lake, the country passed through by the portage-route is broken by roughly parallel ridges of Character of country along portage-route.

rocky hills. These hills rise from 200 to 500 feet above the surrounding water level, and appear to run nearly north-east and south-west. The hills of each chain are usually connected with one another by sharp ridges of coarse boulder-clay. These ridges are highest and thickest on the south-west side of the hills, where their material seems to have been accumulated in the lea of the rocky obstructions to the ice during the glacial period. Like the sharp ridge described at the first portage on the Rupert River, these ridges are largely composed of boulders and semi-angular blocks of gneiss with very little finer material, and have the same characteristic narrow crests, sloping on either side.

Between the ridges the lower ground is often swampy and covered with a network of small lakes. From a rocky hill, 250 feet high, at the portage between lakes No. 10 and No. 11, over thirty of these small lakes were counted, filling the valleys on all sides.

Forest fires.

The greater part of the region is destitute of forest trees, these having been removed by frequent extensive fires. The bare rocks of the hills are thickly strewn with boulders, often of great size, while the valleys are filled with the same, often to a depth of many feet, and without sufficient sand or clay to conceal the space between them. Usually a thin covering of vegetable mould is found on the heaps of boulders. In a few places on the lakes, sandy shores are seen, but the greater part of the shores and islands are formed of solid rock or of heaped up boulders.

Small trees.

The unburnt forest is made up of small trees never more than thirty feet high nor exceeding ten inches in diameter. Black spruce is the most common, and on the lower ground grows thickly together, while on the hillsides it is only found in open glades. Larch occurs in the swamps, and there grows to a larger size than any of the other trees. In abundance, Banksian pine ranks next to the black spruce, but is generally small. A few small trees of white birch are seen in clumps on the higher ground surrounding the lakes, and are accompanied by an occasional clump of struggling aspen never over four inches in diameter.

High ridges.

From the top of a hill rising 350 feet on the north-west side of Clearwater Lake, an uninterrupted view of the surrounding country was obtained. To the southward, the high hills of the ridges already passed are seen extending north-east and south-west. To the eastward, they appear to have about the same altitude as those seen along the route, but to the westward they are considerably higher, and some of them, ten or fifteen miles to the south-west of the lake, must rise from 500 to 800 feet above the general level. Their tops are bare, and large patches of snow were observed on their northern sides on July 14th. Northward, the country is not so broken, and none of the ridges rise above 300 feet, while the valleys are broader, with more swampy land and fewer lakes. Farther away in this direction, there is another range of higher hills extending east-and-west beyond the East Main River.

The country surrounding the discharge of Clearwater Lake is at first rolling, but after passing the small lakes it becomes flat, and the river winds through an extensive swamp, with only a few isolated rocky hills rising from it. The swampy lands are thickly covered with small black spruce, larch and Banksian pine, the trees increasing in size as the East Main River is approached. Boulders are less numerous, and there is a considerable amount of fine yellow sand arranged by the river in small terraces along its banks and about the small lakes. Flat country.

On an island in Clearwater Lake the soil was found to be frozen solid, at a depth varying from six to nine inches below the surface.

East Main River.

The Hudson's Bay post at the mouth of the East Main River, on the east shore of James Bay, has been determined by W. Ogilvie, D.L.S., in 1890, to be in latitude 52° 14′ 45″ N. and longitude 78° 29′ 15″ W. Position of the mouth.

The river, at its mouth, is a mile and a half wide, but is obstructed by a number of sand and shingle shoals, bare at low water, with shallow channels between them. The river-banks are low and sandy. As the river is ascended, the sand gives place to clay, cut in places by the river into steep faces. The Hudson's Bay Company's post is situated on the south side, three miles from the mouth, where the banks are about fifteen feet high. The river opposite the post is a little under a mile wide. Three large islands of clay occupy the southern side of the river for two miles and a half above the post, with a narrow, shallow channel between them and the mainland on that side. Opposite the head of the upper island a small river, called Fishing River, falls into the main stream from the north-east. Tide-water extends seventeen miles up the river, and for this distance the course is about due east. The banks are low, formed of stiff blue clay, and much of the land on either side is low and swampy. The river gradually narrows from a width of three-quarters of a mile, above the islands, to about a quarter of a mile at the head of tide, where a small stream, called Coldwater River, comes in from the south. The current, from the mouth to the Hudson's Bay Company. Head of tide.

head of tide, varies from two to four miles per hour. Along the river-bottom there is an abundant growth of medium-sized white and black spruce, balsam fir, aspen and balsam poplar.

Immediately above the head of tide, the character of the river changes to a succession of rapids, and for the next six miles the banks become increasingly higher, with steep cut faces, showing clay overlain by sand, or sometimes coarse boulder-clay, with an occasional exposure of rock coming up from beneath. The banks here rise from fifty to one hundred feet. The valley becomes gradually narrower and the rapids heavier, until in the upper mile and a half the river is only about 100 yards wide and falls seventy-five feet through a shallow, rocky gorge, called Basil Gorge. The general course of this stretch is N. 75° E. Immediately above these rapids the river again changes to a quiet-flowing stream about 600 yards wide, with low banks and a flat country on either side.

Basil Gorge.

Two miles above the head of the gorge and twenty-five miles from its mouth, the river divides into two branches, which appear to be nearly equal in size, one coming from the north-east, the other from the east, the latter being the one surveyed. From the Indians at East Main post, it was learned that the north-east branch is called the Opinaca or Straight River, and that its volume is about two-thirds that of the other branch. It is much the easier river to ascend, being free from long rapids and portages, and takes its rise in a number of large lakes between the head-waters of the East Branch and those of the Big River.

Straight River

Above the forks the course of the east branch is due east for seven miles, while its width varies from 600 to 800 yards; the current is sluggish and the banks low, but they rise gradually as the stream is ascended, so that in the last mile and a half of this course, they are from fifty to seventy-five feet above it, and present cut faces of stratified sands and clays, or of boulder-clay. The river here narrows to a width of 300 yards and becomes rapid.

Talking Falls.

At the end of this course there is a sharp bend to the south, and a quarter of a mile above the bend is a chute of twenty feet called Talking Falls, with strong rapids below and above it. From this chute, the river, with several minor bends, has a general south-east course for the next six miles, being almost a continuous rapid, with about 120 feet fall, including a chute of sixty-five feet, called the Island Falls, at the upper end. At this chute the river is divided into a number of narrow channels by several small rocky islands. The banks along this portion of the river are not high, and the country appears to rise with the river. There is a portage of 400 yards on the south side past the chute, and two miles above it a small river, called the Miskimatao, comes in from the south.

Above the chute, the river again expands to an average width of 600 yards, and flows from N. 60° E., almost on a level with the surrounding country, for ten miles between low banks of clay capped with sand. The timber continues the same as before, but is somewhat smaller. The river now narrows to 250 yards, and continues with small rapids northward for a mile, between rocky hills, then turning east, it widens slightly and is less rapid for another mile, to the foot of a narrow rocky channel called Clouston Gorge. This gorge for a mile and a half from its mouth is perfectly straight, and is never more than 100 feet wide, narrowing in one place to thirty feet, with rocky sides that rise almost perpendicularly 100 or 200 feet above the river, which rushes through it in one great rapid, falling in the interval 105 feet. Clouston Gorge.

Above this the course changes to S. 70° W., and the river becoming slightly wider, mounts in the next three-quarters of a mile twenty feet to the foot of a rocky island 1200 yards long with a narrow channel on either side. Through these channels the river falls over 100 feet in a succession of chutes. For three-quarters of a mile above the head of the island, there are a number of small islands with rapids between them.

To pass these obstructions it is necessary to portage canoes and outfit three-quarters of a mile through a deep swamp, with only one spot sufficiently dry to allow the loads to be laid down. The portage begins immediately below the gorge on the south side, and ends in a small bay near the head of the islands. Bad portage.

The river is now found flowing nearly at the level of the surrounding country, with a sluggish current between low banks that become more and more sandy. The general course of the next stretch is N. 60° E., and the distance twenty-two miles, the breadth of the river varying from a quarter to three-quarters of a mile, with an average of about half a mile. The limit of balsam poplar is reached near the upper end of this course, a fact due probably to the absence of low clay banks, along the river above. The other trees are smaller, and white spruce beyond this becomes scarce. White birch is now a common tree, and Banksian pine is found wherever second-growth timber occurs on sandy soil. Limit of balsam poplar.

Continuing on the same course for three miles and a half, the river again becomes rapid, and flows in a valley which at first is about 200 yards wide, with scarped sandy banks which rise about 150 feet above it. Soon the channel narrows to less than 100 yards, and the sandy banks give place to rock as it enters Conglomerate Gorge. In the upper half of the distance the fall is very steep, the river passing with a succession of chutes, in small channels between a number of small, narrow, rocky islands. The total fall here is over 100 feet, including three chutes of twenty, ten and thirty feet respectively.

Conglomerate Gorge.

Character of the lower river.

From the head of this rapid, the river bends to the south for a mile, then S. 30° W. one mile, and again south another mile to a chute of ten feet. At this last fall, the character of the river and surrounding country changes. From its mouth to this point the river has flowed in a shallow valley, nearly on the surface of a number of broad terraces of stratified sand and clay, arranged one above the other. Where it descends from one level to the next, the river has cut a valley back into the sands and clays of the upper terrace until the underlying rock has been reached, over which it falls in a succession of rapids and chutes, often hemmed in by steep rocky walls.

Marine terraces.

The terraces are composed of marine deposits laid down during the depression of the land at the close of the glacial period, when the level of the western side of the Labrador Peninsula was over 600 feet lower than at present. Farther up the river, marine deposits are wanting, and the surface material is formed of unstratified, coarse boulder clay. Owing to the absence of terraces, there are no marked drops from level to level, but rather a more or less gradual slope of the whole country, while the river, without even a shallow valley as in its lower part, flows almost at the level of the country and follows the general slope, except where diverted by rocky ridges that cross its course obliquely in several places. In the lower part the river is obstructed only by islands at the various falls, and there are few rock-exposures elsewhere; while in the upper part rocky islands are everywhere numerous, and long stretches of the shores are also formed of rock.

Country surrounding the lower river.

The surrounding country, in the lower part, is generally flat and often swampy, but there is a marked absence of small lakes though about the upper part of the river some are found in every valley between the low, rounded, rocky hills that characterize this region. The soil in the hilly country is scant and poor, being composed wholly of boulder-clay, often with very little finer material. The climate also appears to be more rigorous than it is nearer the sea-coast, and the timber is much smaller, consisting of the following species arranged in order of abundance :—Black spruce, Banksian pine, larch, balsam fir, white birch and a few stunted aspens. The larch grows to the largest size, a few trees being upwards of twelve inches in diameter near the base; the other species seldom or never have a diameter

Timber.

exceeding nine inches, and in the upper part of the river are only found growing thickly on the lower ground, about streams or lakes, with the hills only partly covered by small trees of black spruce and Banksian pine. The white spruce does not grow beyond the limits of the deposits of marine sands along the East Main River.

Above the last-mentioned chute, the next course is about due east, including two short sharp bends to the south, in a distance of eight miles. Along this course, the river flows in a shallow, rocky channel, about a quarter of a mile wide, through an almost flat region, broken only by a few low, rounded hills. The descent is sharp, there being five rapids and two chutes of six and eight feet, separated by short intervals of swift current. At the upper rapid and chute, the river bends to the south-east, for another eight miles. In this interval it is broken into several channels by a number of large low islands, strung out along the entire distance. The current in these channels is moderate, with only one small rapid near the upper end. The Kausabiskau River is a small stream, that falls in on the south side near the foot of this rapid. Character of river above Conglomerate Gorge.

Further up, the river for twenty-five miles, forms a long gentle curve, bending first slightly north and then south of east, so that a line joining the ends of the curve would run east-and-west Here, stretches of quiet water connect five short heavy rapids. Rocky islands are numerous and the shores are low and in places rocky, but more commonly swampy. To the south, there are hills running in ridges roughly parallel to the course of the river. These culminate four miles up this course, in Flat-topped Mountain, that rises nearly 500 feet above the water-level. The rest of the range rarely exceeds 300 feet, and 250 feet may be taken as its mean height above the general level. Similar ridges of rounded hills are seen to the northward, but they do not appear to be as high as those on the other side and they are more distant, leaving a wide margin of low swampy land between their bases and the river. The trees on these hills have almost all been burnt recently, leaving only a few patches of green wood. Where the rapids occur in the river, the hills close in on either side. Swamps.

Medium sized rivers fall into the main stream at the second, sixth and tenth mile of this course. The first and third are called respectively, Wabistan and Akuatago, both coming from the southward; the second is called the Wabamisk, and comes from the northward. It is much larger than the others, being about 200 feet wide, at its mouth, with a slow current. Wabistan and Akuatago rivers.

The main river above bends to the south-east for eight miles, and then to the east again for eight miles. The country and river have much the same character as the part last described; the current being somewhat stronger, with three small rapids. At the upper end of the last course, there is a small stream, called the Clearwater River, that comes in on the north side, and flows in a wide straight valley from E. N. E., a continuation of the valley in which the main river flows below. The Indians who hunt in this region, say that it is only a half day's journey from the mouth of this stream to a large lake on a branch of the Straight River.

The Great Bend.

Turning now sharply to the south-west, the main river, which has had an average breadth of over a quarter of a mile, enters the Great Bend, and contracts to about 100 yards, and for the next fifteen miles is nothing but a succession of heavy rapids and chutes. Its banks are high and rocky in most places as it breaks the range of hills before mentioned on the south side. The surrounding country is much rougher than any before seen, with rounded hills, from 200 to 300 feet high, arranged in close parallel ridges. The lower six miles of the river are particularly rough, and as the perpendicular cliffs on both sides render portaging impossible in many places, it is with difficulty that this part of the river is passed with canoes. At one place about three miles from the foot of the rapids, there is a sharp bend to the northward, and the water rushing down is deflected by a sharp point running out from the east side at the bend, which causes the greater volume of the water to enter a small bay, where a great whirlpool is formed. It is stated that many years ago two large canoes belonging to the Hudson's Bay Company were drawn into this whirlpool and all on board drowned.

Broken country.

Whirlpool.

At the upper end of this south-west course, a small stream, called Misiatawagamisistic River, comes in from the south-west, and it is believed that there is a portage-route by it, past the rapids below.

Turning now to S. 40° E. for three miles, the river gradually widens, and passing two small rapids, again becomes easily navigable. It flows, with a sluggish current, in a channel 500 yards wide, and only slightly below the level of the surrounding low, flat, swampy country. This continues for fifteen miles, the general course being N. 60° E. Two small rivers come in along this course from the north. At the upper end there is a fall of ten feet, above which the river, continuing along the same course for fourteen miles, has a similar sluggish current, with the exception of one small rapid at the head of two large islands. The surrounding country remains low and swampy, except in the vicinity of the rapid, where a low range of hills passes close to the river on the south side.

Country above the Great Bend.

Above the two islands, the river again turns to the east, and flows with a remarkably straight course for nineteen miles. The hills on either side here close in and narrow the valley, through which the river runs at a uniform rate of about four miles per hour, in a shallow channel averaging 400 yards in width. The hills, as a rule, do not rise much above 200 feet from the water, and only an exceptional one reaches 300 feet. They are arranged in ridges nearly parallel to the course of the river.

Along the upper three miles of this course, the channel narrows to about 150 yards, and the current increases where a descent is made through a narrow cut in the hills. There is now a sharp bend to the south and then to the south-west for a mile and a half, as the river cuts through a range of hills, with a fall of twenty-five feet, including a chute of fifteen feet. At the bend, a small river comes in from the north-east. Narrow channel.

The surface material covering the hills along the last two courses is generally thin, and is in places composed largely of boulders, often of large size, with the spaces between them only partly filled with finer material. Soil.

The forest, for the most part, is made up of small second-growth black spruce, Banksian pine, larch, balsam fir and white birch, with a few aspen poplar. Forest.

Above the bend, the river again enters another valley between parallel ridges. Its courses are: first, east five miles, then N. 60° E. four miles, and again east eight miles. The average width is again about 400 yards, with a swift uniform current and only one small rapid. As this portion is ascended, the country becomes rougher, and the hills rise with steep slopes, from 200 to 400 feet above the water. The greater part of this region has been recently burnt, only patches of blackened soil being left to partly cover the rocky hills, while innumerable boulders are seen scattered everywhere over the surface. A river about three chains wide at its mouth comes in from the south at the end of the first course. Rougher country.

Another sharp bend of three and a half miles to the west of south now follows, and in the lower mile and a half the river passes through a narrow rocky channel with perpendicular sides, called Prosper Gorge, and falls in a succession of chutes and rapids over one hundred feet. To avoid this obstruction, the river was left four miles and a half below the bend, by a portage of three-quarters of a mile, which passes over a ridge and ends about the middle of the west side of a lake three miles long and three-quarters of a mile wide. This lake discharges from its Prosper Gorge.

6½

north-east end by a small stream, nearly a mile long, into a second lake one mile long by half a mile wide. Crossing this lake, the small crooked stream by which it discharges, is followed some two miles to where it falls into the main river, two miles above the bend, and thus above the chutes and rapids. There is only a slight fall from the upper lake to the river, and as a consequence, when there is a freshet in the main stream, the water from it backs up into the lakes instead of discharging from them.

Above this portage the river becomes very crooked. It first flows from the east for a mile and a half, then from south-east one mile, N. 80° E. three miles, S. 30° E. three-quarters of a mile, S. 45° W. a mile and a half, and finally S. 45° E. six miles, where it leaves an expansion over one mile wide, and full of large islands, at the foot of the Ross Gorge, running south.

Ross Gorge.

Through this gorge the river falls sixty feet in two miles. The portage past it starts from a small bay on the west side, and is divided into two parts by a small pond. The first part is 300 yards long and rises about 150 feet; the second is three-quarters of a mile in length, passing over a steep ridge of boulders and ending in a small stream which enters the river a short distance above the head of the chutes.

About half a mile below the upper end of the portage, a river falls in on the north side. It flows in a deep, rocky valley running east-north-east for several miles, and has a long heavy rapid above its mouth. Its size has been estimated at about one half that of the main branch, and it has been called Ross River. Above the gorge the main river is split into a number of small channels by several low islands. These islands form a delta in the eastern end of Lake Nasaskuaso, which extends to the westward six miles, and is a mile and a half across in its widest part. The river passes only through the east end of the lake, which formerly must have extended to the head of the portage, the portion now occupied by the delta having been filled up with alluvium brought down by the river. Surrounding the lake are rocky hills that rise from 200 to 400 feet above its surface. The greater part of the adjacent country has been burnt over recently. From its west end, the canoe route of the Hudson's Bay Company leaves the East Main River to cross to the Rupert River on the way from Nichicun to Rupert House. This lake is considered by the employees of the company to be situated half way between these two places. The Indians who hunt in this region are in the habit of congregating here and on the lakes at the foot of the large island above, to meet the canoes going to and returning from Rupert House.

Lake Nasaskuaso.

Hudson's Bay Company's canoe route.

Above Lake Nasaskuaso the character of the river and country again changes, the latter becomes flatter and less rugged, the hills seldom rise over 150 feet above the river, and the ridges are farther apart, with swamps and small lakes filling the broad shallow valleys between them. The river flows almost on the surface, and is often divided into several channels by large islands. Small lakes and bays also branch off on either side, so that it is difficult to tell when a tributary river falls in. Character of country above Lake Nasaskuaso.

In this manner the river continues for nine miles, when it becomes divided into two main channels by Grand Island, fourteen miles long and five broad. The north channel is more than twice the size of the south one, and it is further sub-divided, especially in its lower part, by large islands. The south branch, from the foot of the island, passes southward about five miles and widens out into two lake-expansions with numerous bays, all having an east-and-west direction. Into the south-west bay of the upper lake, five miles from its outlet the Clearwater River enters. This is a small stream flowing out of a large lake of the same name on the portage-route from Lake Mistassini. Grand Island.

The upper lake referred to has been called Tide Lake, on account of the deposits of mud that cover the shores and islands up to freshet mark of the river, giving the lake the appearance of a tidal bay at low water.

For seven and a half miles above the head of Grand Island, the river averages 500 yards in width, but is shallow and much obstructed by sandy shoals. Its direction is again east, and at the head of this course is the junction of the Tichegami River. This stream takes its rise, according to the Indians, to the south-east, near the head-waters of the rivers flowing into the north end of Lake Mistassini. In volume, it appears to be about two-thirds that of the main branch, and it has a heavy rapid at its mouth. Tichegami River.

There are only a few families of Indians who hunt along the lower part of the East Main River, there being a long interval from Lake Nasaskuaso to below the Great Bend, that is totally uninhabited. Owing to the numerous rapids and chutes, this river above the mouth of the Straight River, is not used as a highway to the interior, and only one family ascends it above that stream. Previous to 1889, there were three families who hunted in the neighbourhood of the Wabamisk River, but during that winter, with the exception of one woman and a small boy, these all perished by starvation or cannibalism. In 1892, the scene of this tragedy was found at the mouth of that river, but, nothing being known of such an occurrence, it was only remarked as Indians of the East Main River. Famine.

unusual that Indians should leave their tents standing, and their household effects scattered about.

Above Lake Nasaskuaso, from the many old camps seen along the river, there must be a number of families who hunt in this vicinity, and who in the summer descend to Rupert House, by the portage-route to the Rupert River. Owing to the absence of hunters along the greater part of the river, the fur-bearing animals are rapidly increasing, and beaver signs are quite common; bear tracks are also numerous in the burnt regions. Not a sign of caribou was observed from Lake St. John to James Bay, and these animals seem to have been totally exterminated in the region about Lake Mistassini and from there westward to James Bay, being now only met with to the north and north-east of the East Main River.

Increase of fur-bearing animals.

Fish.

Fish are found in abundance in every lake and river, throughout the region. The following kinds were taken in the net along the East Main River:—Whitefish, pike, pickerel and suckers. In the lower parts, where the banks and bottom are formed of clay, sturgeon are taken in abundance by the Indians; and from the mouth to the first fall, and in the tributary streams, small whitefish and sea-trout ascend from the sea in large numbers, from about September 1st, until the river is closed by ice. Trout are also caught in the rapids of the upper part of the river.

Upper East Main River.

Three miles above the Tichegami, a rocky ledge crosses the river diagonally, causing a low fall, where the survey of the lower part of the river in 1892 began. Above this fall the river bends sharply northward for a half mile, and then about south-east for three miles, to the head of a long, but not strong rapid, which occupies the upper half of that distance. The direction now changes to north-north-east for two miles and a half to the mouth of the Kowatstakau River, a large branch coming in from the northward and entering the river from a considerably higher level by a heavy rapid or low chute. According to Indian estimation this stream carries about one-sixth of the water of the main river. Immediately above the forks, what appears to be another branch, also broken by rapids, is seen on the south side; but it is only a channel passing on the south side of a large island or islands, and separating from the main channel above the rapids and portage, five miles farther up. The north or main channel contracts from a width of nearly half a mile, below the island, to less than a quarter of a mile, and the current is quite strong, with two rapids, the lower of which

Kowatstakau River.

two miles above the foot of the island, is a half mile long; but the upper one is short and steep, with a tremendous rush of water, the river falling eight feet in one hundred yards. The portage is on the north side, and is called the Sunday Portage.

Character of surrounding country.

Up to this portage the country surrounding the river is low and almost flat, with only a few isolated hills that seldom or never exceed one hundred feet in elevation above the general level, while the river flows only slightly below it, in a shallow valley from 300 to 1000 yards wide, having in most cases low sandy banks never more than seventy feet high. The sand and gravel of the banks are made up of modified boulder-clay arranged by the action of the river. On either side of the river, the soil appears to be light and sandy, and, as small fires only have traversed this region, the timber has not been destroyed, but thickly covers the country, the trees occurring in the following order of abundance:—black spruce, Banksian pine, larch, balsam fir, white birch and aspen, the last being exceedingly rare and only found along the river in low straggling clumps.

Above Sunday Portage the river flows directly from east for the next four and a half miles. The average width is nearly 400 yards and the current is strong, with two rapids one and two miles above the portage, the upper one being so heavy that canoes must be lightened to ascend it. The portage past it is about 200 yards long, on the north side. At the foot of the lower rapid a small branch from the south joins the river.

Pond Portage.

The river now turns sharply to the northward, and, flowing from that direction, in the next mile breaks through a low ridge in a shallow, narrow, rocky channel, and falls fifty-five feet from the level above, the descent taking the form of a heavy rapid. To pass this the Pond Portage is made on the east side. To reach it a small stream is ascended about 200 yards, and from there 200 yards portage up a low hill leads to a small pond; crossing this, a rough road over boulders and through swamps for half a mile ends at a small channel of the river, behind an island. From here the course is N. 45° E. for a mile, and then in a general direction N. 45° W. for five miles, with many minor bends and crooks. About one mile up this course, what appears to be a large branch comes in on the east side, but it is probably only a channel leaving the main stream several miles above, and so forming a large island. The river continues about a quarter of a mile wide, is shallow, and flows with a strong steady current, breaking into small rapids at points and narrows. Another small stream comes in from the northward at the upper end of the course. Now again bending eastward a mile above, the river widens out into a small lake, so crowded with low islands that its limits cannot be seen.

Character of country above Sunday Portage.

From Sunday Portage to this lake, the character of the river banks and surrounding country is similar to that before described, the banks being low and the country nearly flat, with isolated hills and rocky ridges generally under 100 feet, and never exceeding 250 feet in elevation.

Height above sea-level.

Owing to an unfortunate accident on the Koksoak River, through the upsetting of one of the canoes, the barometer readings were lost, and only a few booked in the survey note-book remain. From the mean of these data the height of the river in this vicinity is roughly found to be 1400 feet above sea-level, which agrees closely with the supposed difference of level between here and Lake Mistassini, that place being fixed from the mean of readings taken from two aneroid barometers and extending over several months.

Hills.

From the lake-expansion, the river bends southward for a mile, and then directly east, flowing from that direction four miles, from the base of a high rocky hill on the north side, which forms a part of a range extending from beyond the north side of the lake to the eastward. These hills are very steep and rocky, being formed of the hornblende-granite that now takes the place of the softer schists and gneisses of the flat country below. They rise from 400 to 500 feet above the river.

Trees.

Before reaching the foot of the hills, the river becomes somewhat wider and flows between low banks of sand and gravel with a moderate current in a shallow channel, much obstructed with low sandy shoals. Much of the surrounding country has been burnt over, and in part is covered with small second-growth trees, Banksian pine then predominating. Where unburnt, the forest is somewhat larger and thicker than that seen lower down; this is owing most likely to a better soil.

Lower country about Sharp-rock Portage.

At the foot of the hill the river again abruptly bends to the south for a mile and then gradually turns and resumes its easterly course for five miles to Sharp-rock Portage. Up to here the character of the river is similar to that lower down, being flat and shoal, with a moderate current broken by two short rapids, the lower on the bend and the upper two miles above it. The range of hills on the north side continues along the river and crosses it at the portage, but so much lower that at the crossing it is little over a hundred feet high. To the southward the country is almost flat and both sides have been almost totally burnt over, the fire on the north side being most recent.

Sharp-rock Portage is on the north side and is about 400 yards long, the lower half passing over sharp vertical bands of hornblende-schist. The river falls ten feet over the same ledges.

Above the portage, the course is N. 60° E. for three miles to another portage, 200 yards long, where a chute of eight feet occurs. Between the portages the banks are low, with traces of a terrace twenty feet high on the south side.

Farther up, the river flows from the north for a mile, and then from the east four miles to where it passes out from between rocky hills, from 200 to 250 feet high. From the last portage to this point, the flat valley is somewhat wider, and the shallow channel of the river is obstructed by a number of islands and gravel shoals, the current here being very strong. Wide valley above Sharp-rock Portage.

After the hills are entered, the course is south-east for two miles, and then north for two miles. Along the south-east course the river is less than 300 yards wide, but on the northern course the width is irregular, varying from 300 to 800 yards. The current everywhere is strong.

At the bend, a medium-sized stream comes in from the south, and perhaps another on the north side a mile below. Another bend to the eastward, and a mile of river, leads to Mink Chute, thirteen feet high, passed by a short portage over the rock on the east side. Mink Chute.

The country surrounding the river from Sharp-rock Portage to here, is rougher than that seen below. The ridges of rocky hills are closer together and slightly higher, and there are also ridges of till apparently arranged roughly parallel to the direction of the glacial striæ, or S. 70° W. On both sides of the river there have been extensive fires and little of the original forest remains. The trees continue similar in size and numbers to those described below, aspen being the only one now absent. Terraces of sand and gravel are seen on both sides up to thirty feet above the water, and occasional cut-banks of boulder-clay are noticed, where the river has eaten away parts of the low hills of drift mentioned above. The rocky hills are moderately strewn with boulders. Character of country above Sharp-rock Portage.

Mink Portage is followed closely by another short one, on the south side, past a chute of nine feet; and then for five miles the river flows rapidly between low and rocky banks to Channel Portage. This portage is on the north side, and is about 800 yards long, terminating in a small channel above a fall and behind several rocky islands. Up to the head of the islands there is but one small rapid in the next mile, whereas the main or south channel is a succession of chutes and heavy rapids for nearly two miles. Channe Portage

From the head of the islands, the river widens to over half a mile and flows evenly from the north-east between low sandy banks, over which can be seen high hills in the distance to the north-east, east, and south-east.

Four miles of quiet water is followed by a shallow, flat rapid, full of small rocky islands and large boulders. After a sharp bend the course is to the north for a mile, and then north-east for two miles to another small lake-expansion. Along the two last stretches, the river, contracted to less than 300 yards, flows between rocky banks, and is greatly obstructed by rocky islands and ledges, which cause short heavy rapids with very swift water between them.

Character of country above Channel Portage.

On the south side, at the head of the rapids, a conical hill rises 350 feet above the river. From its top a good, unobstructed view of the surrounding country may be obtained, as it is totally burnt over and bare. To the north-east, the river is seen flowing with but one bend, through a wide, straight valley, surrounded by low hills. Those on the north side are about 200 feet high, and are arranged in close, compact ridges, everywhere well wooded. On the south side, there is a wide valley filled with small lakes, that separates the conical hill from a higher range parallel to, and forming the north wall of the river-valley. The highest of these hills reach and may exceed 500 feet. They are bare and rocky, and have a very barren, desolate appearance, due to the absence of green woods; fire rather than unfavourable climatic conditions being the cause, as some of the hills have small patches of unburnt trees upon their summits. The sides and tops of these bare hills are strewn with innumerable boulders of all sizes, from masses several tons in weight to small gravel, but there is not much of the finer material on the upper parts.

Timber.

In the river-valley, larch is seen eighteen inches in diameter, and black spruce and balsam fir of twelve inches, are common. The only evidence of an approach to barren ground, is afforded by the thinning out of *Ledum* and *Kalmia* and the substitution of white reindeer moss as undergrowth, while the trees begin to grow wider apart with frequent open glades.

Abundance of till in this region.

Above here the character of the river changes somewhat, long islands of till are numerous, and there is a marked absence of terraces or stratified deposits, these being replaced by banks of irregular height and outline, formed by the river cutting through the low lenticular hills of moderately fine boulder-clay. The islands formed of similar materials, appear to be hills of the same description, and have only been separated from those on either shore by shallow channels cut between them. For three miles and a half the river is over half a mile wide, but is very shallow, and its bottom is thickly strewn with boulders and subangular blocks of gneiss and granite, very similar to the rock-masses seen in place in the vicinity. The descent, both here and in the expansions further up stream, is constant and quite steep, causing the water to flow with a very swift smooth current, which is more difficult to ascend in canoes than broken water, where the eddies and quiet places behind boulders and other obstructions are available to rest before the canoemen attempt other short ascents; whereas in the steady, strong, smooth current no such chances to rest occur, and every foot gained must be held.

Bending from east to north-east, the river contracts to about 300 yards for two miles, and again expands at the head of a large island, at the end of the course. Two small streams enter from the north, at the upper and lower ends of the stretch.

Turning eastward again, the banks become more rocky and irregular, with numerous small bays, so that the breadth of the stream varies from 300 to 1200 feet. There is a small rapid one mile and a half up, and at its head a large stream named the Misask River enters on the north side. From this place the general course is N. 50° E. for six miles, to the Cascade Portage. Misask River.

Immediately above the Misask River, the main stream is divided into two equal channels by a large island. The north channel is followed east for two miles and then south for three-quarters of a mile to the head of the island. The whole distance is a continuous rapid, culminating on the south bend in a chute of fifteen feet, which is passed by a portage of 800 yards on the east side. There is a steep rise of one hundred feet at the lower end of this portage, from the river up a cut-bank of till, to the level of the ridge above. From the head of the island, half a mile of quiet water leads to another portage, on the west side, 1000 yards long, past heavy rapids, followed by small rapids for half a mile, to the foot of another large island. Following the smaller and southern channel, another half mile of stiff current leads to the Meat Portage, 300 yards long, on the west side. Another short rapid is then passed, to the head of the island. The rise in the river has now brought it to a level with that of the surrounding country, which is broken only by low ridges of till and an occasional rocky hill, seldom exceeding one hundred feet, so that the surface presents the appearance of a very rolling prairie, especially to the southward, where most of the trees have been burnt. Everywhere the surface is covered with innumerable boulders and subangular blocks of granite and gneiss. Heavy rapid to Meat Portage.

Character of the river below Long Portage Creek.

Having now reached the general level, the character of the river changes, and for the next nine miles, to Long Portage Creek, it is a succession of lake-expansions, connected by short rapids. These expansions are broken by deep bays, running between the low ridges, and often pass by small narrows into other lakes, the country being now covered by a perfect network of small lakes and watercourses, lying between the low hills. The general course is slightly south of east. The first lake is about one mile and a half wide, and it is two miles from the head of the island to the next narrows and rapid. The water is shallow and there are several large islands. The rapid above is half a mile long and is followed by a smaller lake, one mile long, to a very heavy rapid, passed by a portage of 900 yards on the south side. Above, there is quiet water for half a mile, and then rapids, half a mile long, are followed by swift current for two miles to the next lake-expansion. This lake is also full of large islands, and a narrow channel on the north side leads into a chain of lakes extending over ten miles to the north-east and branching off into numerous other small lakes on either side of the main chain. A mile and a half of steady current leads to another small lake, into which the Long Portage Creek flows.

River above Long Portage Creek.

Here the main river takes an abrupt bend to the south-west, and after a short sharp rapid is ascended is found to widen out into a string of lakes with numerous deep bays, for about fifteen miles; it then breaks into a heavy rapid two miles long, above which it continues south-west for a considerable distance, when it again turns eastward, passing behind a high hill some fifteen miles south of the forks.

Character of country above Long Portage Creek.

The country about the forks is very similar to that already described, consisting of a series of low ridges of boulder-clay, arranged in broken roughly parallel lines, coinciding with the direction of the glacial striæ, or S. 70° W. The general height of the ridges is about fifty feet, while the highest rarely exceed one hundred feet. Between and parallel with them are innumerable small shallow lakes, irregular in shape and full of high islands formed of mounds of till. These lakes are joined together by small watercourses, following each valley, and the different chains often have lateral connections where an interval occurs between overlapping ridges. The only conspicuous landmark in this vicinity is the rocky hill situated about fifteen miles south of the forks; it rises about 500 feet above the general level, and is unconnected with any other high land. To the south, south-east, east and north-east the horizon is bounded by chains of high hills, at a distance ranging from twenty to fifty miles from the forks.

The East Main River was explored only as far as the head of the two-mile rapid mentioned above. The route to Nichicun leaves the main stream at Long Portage Creek, where the river is still a large stream, being nearly 200 yards wide at the rapid there, with an average depth of three feet. According to information received from the people at Nichicun, the main stream, although large where the route leaves it, soon splits up into numerous branches, none of which are of any considerable volume or length. The river bends to the south-west for some twenty miles, and then turns eastward again along the northern foot of the mountains that here form the watershed between the Rupert, East Main and Big rivers, flowing into Hudson Bay, and the Peribonka and Outardes rivers, emptying into the St. Lawrence. Upper East Main River.

Misawau or Long Portage Creek, from its mouth to the portage, following the stream, is thirty-three miles long; but in a straight line the distance is twenty-four miles, and the general course is slightly north of east; the difference in length being due to its crooks and turns. From the East Main River, for the first six miles the course is north-east, the stream here consisting of a number of small irregular lakes, joined by short stretches of river. At these narrows the river is generally about one hundred feet wide, with a moderate current and deep water. This course terminates with a rapid of six feet fall, passed by a portage of 400 yards on the north side. Long Portage Creek.

For the next four miles the river flows from the east, with a uniform breadth of one hundred feet. The current here is strong, with three short rapids, the upper passed by a *demi-charge*. Next follow small lake expansions and swamps for four miles, in the same direction, with one short rapid near the upper end. Still further up, the river is crooked, and forms a reversed curve, ending at the forks, four miles beyond, where it splits into two equal branches, the route following the eastern one.

Above the forks, the average breadth continues to be about one hundred feet, and where small rapids or swift current occur the water is so shallow that wading is resorted to in order to pass loaded canoes. For nine miles from the forks, to the Rocky Portage, the character of the river is constant; it has in most places a sluggish current, with small shallow rapids at long intervals. The banks are low, and the immediate surrounding country swampy. The portage is 500 yards long, and follows the side of a hill on the south shore. The river here passes through a narrow valley, between high rocky hills, and in so doing falls thirty feet. The valley widens above the portage, and the river again flows from the east, in a low valley, Rocky Portage.

filled with numerous small lakes on both sides, connected with the river. As the Long Portage is approached, the river becomes more rapid and shallow, and it is only with great difficulty that loaded canoes can be taken up it. It is left at the Long Portage, where it turns to the northward, rising in the small lakes in that direction, at no great distance above this place.

Character of country about Long Portage Creek.

The country surrounding the lower part of this stream is almost flat, and is traversed by ridges of till never more than fifty feet high. These gradually rise until the forks are reached, where they average 100 feet. From the forks to the Rocky Portage the hills recede, leaving a low swampy valley through which the river flows sluggishly in a channel but little below the general level. At this portage the first rock seen in place along the river occurs. The stream here falls over ledges of red granite as it passes down a narrow valley between two steep rocky hills that rise abruptly to 300 feet.

From here to the Long Portage the valley is again wide and strewn with numerous small lakes and swamps, connected by short channels with the main stream. The hills on either side now have an average elevation of 300 feet, and often show rocky faces.

Over one half of the country surrounding the river has been burnt, and is now covered only with low shrub and reindeer moss. Owing to the want of forest growth, the innumerable boulders and angular blocks of all sizes stand out in remarkable distinctness, giving to the hills the appearance of gigantic plum puddings. These blocks and boulders with the amount of drift are a feature of the country, the drift along the lower parts of the stream being so thick that it covers all the underlying rocks which can be determined only from the profusion of angular, untravelled blocks scattered about. On the very summit of the high granite hill on the north side of the river, at the Rocky Portage, there is a perched boulder over ten feet cube. Its corners are only partly rounded. Numerous other large boulders are scattered over the highest parts of this hill, and so thickly are they everywhere strewn that one might walk for miles over the country in almost any direction without touching the soil with the foot. The trees along the river are small and somewhat scattered, with little underbrush, the ground being covered with white moss and arctic berries. Black spruce predominates, with larch in the swamps and Banksian pine on the higher lands. There are also a few small white birches and balsam firs. One very small clump of aspen was noted.

Long Portage

The Long Portage is two miles in length, and from the creek passes S. 30° E. over a ridge 200 feet high, terminating at a small lake 150 feet above its lower end. The lower half is burnt bare, but there is at its upper end a thick growth of small black spruce, with a few Banksian pines and larches. This portage is over the watershed which divides the creek from the waters of the Pemiska Branch of the East Main River.

From the portage at its upper end, a small shallow lake is followed by a portage of one mile to a slightly larger shallow lake full of great blocks of granite, which in turn is followed by another portage of a half mile, ending in another small lake, triangular in shape. The route to here has been due east; it now turns south, and in a half mile leaves the lake by the stream flowing out, with a short portage past a small rapid at the outlet, and so into Opemiska Lake. The country surrounding the small lakes consists of low ridges of till from fifty to one hundred feet high, well covered with small black spruce and larch to the exclusion of all other trees.

Opemiska Lake is six miles long, with an average breadth of three-quarters of a mile. Its longest axis lies nearly east-and-west. The water is clear and shallow. There is one deep bay at the north-west end, full of small low islands. The shores are generally low and sandy, and the surrounding country is also low, with small ridges of till. Ten miles to the south-east of the lake, a high isolated hill rises about 500 feet above the general level, forming a conspicuous landmark; is regarded by the natives as the dwelling place of spirits, and on that account given a wide berth. The country about here is unburnt, and is well wooded with black spruce and larch, the former constituting over ninety per cent of the trees. The only other tree met with is balsam fir, found sparingly about the shores of the lake. Opemiska Lake.

The Pemiska branch of the East Main River, flows out on the south side, about the middle of the lake, and leaves it with a heavy rapid. Its volume here does not exceed one-quarter of that of the river at the mouth of Long Portage Creek. The route follows the lake to its eastern end, where it ascends for two miles a small river about fifty feet wide and full of rapids, with a total fall of twenty-five feet. Three short portages are necessary to pass the strongest parts of the rapids. The country surrounding the river is low, rough and rocky, with a superabundance of loose blocks and boulders, many of great size. Two were seen resting on a rocky knoll at the head of the rapids; the larger is more than twenty feet cube, and the smaller more than fifteen feet cube. Pemiska Branch.

The river ends in Wahemen Lake, another large body of water stretching to the eastward, divided by long, low ridges of till into Wahemen Lake.

a bewildering number of deep bays. The route closely follows the southern shore, and, passing a small narrows, ends at a portage four miles from the outlet. The portage is 1400 yards long, and joins the river above a heavy rapid. From there to Patamisk Lake, at its head, the distance is eight miles, in a general east course. The river passes through five small lakes, each full of deep, narrow bays, and connected with the next lake by short, rapid stretches. The numerous bays and the small size of the stream makes it very difficult to follow the route without a guide.

Patamisk Lake.

Lake Patamisk is reached by a portage of 1000 yards past a rapid in the river, which is here not above twenty-five feet wide and very shallow. This lake is the largest passed through between the East Main River and Nichicun. The route traverses the lake to the end of the north-east bay, seven miles from the outlet. Large deep bays indent both sides, and the main body is filled with large islands, which obstruct the view and hide the real size of the lake. A deep bay extends westward from a point half a mile above the outlet on the south side. The limits of the shore on the north side could not be determined, nor those of a wide deep bay on the south-east side, but the lake evidently extends to the foot of some hills about ten miles from its entrance. The water is very clear and in places deep, but as a rule shallow.

Watershed between East Main and Big rivers.

A portage of 500 yards leads from Patamisk Lake to a small shallow lake one mile long, with a portage 200 yards from its east end into another smaller lake half a mile long. The portage from this lake crosses a low bouldery ridge and ends in Kawachamack or Crooked Lake, about twenty feet below the level of the last, draining into the Big River ; so that the last portage is over the height-of-land between the Big and the East Main rivers.

Character of country at the watershed.

The country surrounding the route from Lake Opemiska to the height-of-land is everywhere the same, consisting of ranges of hills of boulder-clay seldom more than 100 feet above the general level. These are separated by wide irregular valleys filled with small lakes, so that fully one-third of this area is covered with water. An occasional rocky hill may be seen rising from beneath the masses of till, sometimes attaining a height of 300 to 400 feet. Immense numbers of boulders and loose angular blocks continue to be scattered in wild profusion everywhere. As the height-of-land is approached, the forest growth becomes smaller and less thick, and is made up almost wholly of black spruce, the largest of which are about six inches in diameter ; the only other tree is the birch, which forms less than ten per cent of the whole. Where fire has passed, a number of years elapse before the second growth of black spruce springs up, which it does then only in a thin straggling manner.

Crooked Lake, stretching N. 60° E., is nearly five miles long and averages one mile in width, with numerous small lateral bays, which give it an irregular outline. The western part is filled with islands. The north shore is almost wholly burnt and bare, while small black spruce and larch cover the hills on the south side. The country becomes higher and rougher, with more rock showing up from beneath the drift. A short portage at the east end leads directly into the south-west branch of the Big River. This river rises about sixty miles to the south and south-west, where it drains a number of lakes lying along the northern slope of the mountains, close to others emptying into the head-waters of the East Main River to the west and those of the Outardes River on the south side of the mountains. The watershed in consequence runs east-and-west here, on or near the fifty-second parallel of latitude. Crooked Lake.

The route enters the river at a bend, where its course changes from north to east. In size it is nearly as large as the East Main River at the mouth of Long Portage Creek, being in the rapids about 200 feet wide, with deep water flowing four or five miles an hour. Big River.

From the portage, the river flows N. 60° E. for eight miles, to the foot of a sharp rocky hill 280 feet high. It flows almost level with the general surface, and, like all the streams of the region, is made up of a series of small irregular lake-expansions, connected by short narrow stretches of swift water. Even in the widest parts a moderate current is appreciable. At the foot of the hill, the river enters a large lake that stretches several miles to the eastward, and has several deep narrow bays separated by low parallel ridges of till. This body of water is called Big Back Lake. The river flows only through its north-west part, leaving it half a mile below its entrance, and then bending sharply to the west, passes close to the foot of the hill, and enters Back Lake. From the top of the hill, looking north-west, the country as far as could be seen in that direction appears as if covered by a great number of small lakes that lie parallel to, and are separated from each other by low ridges running east-and-west. These are not separate lakes but deep bays of either Back or Nichicun lakes, these two bodies of water being separated only by a small short rapid. Back lakes.

This rapid is five miles from the foot of the hill, through Back Lake, but the irregular shore-line of the lake must be at least fifty miles long. From the hill, the irregular outline of Nichicun Lake is seen stretching away toward the north for a great distance, bounded by Lake Nichicun.

bold rocky hills often rising from 400 to 500 feet above its level. Through breaks among these are seen the valleys of the outlets of the lake. Toward the east, the country beyond the Back Lakes is seen rising in ranges of hills from 300 to 800 feet high, of sharper outline than the ordinary Laurentian hills. These bound the horizon to the south-east and south, and are said to form the north-east flanks of the central mountain range of Labrador which extends along the watershed in a north-east and south-west direction from the bend of the East Main River to about thirty miles east of Nichicun. Thence it gradually sinks and is lost in the general level of the country, which must there be over 2000 feet above sea-level. To the south-west and west the country is lower, with isolated rocky h ls rising above the level of the low ridges of till.

Forest fires.

The only signs of an approach to the barren lands is the lack of trees on the tops of the highest hills, but the rest of the country is well wooded where unburnt. Fires have destroyed great areas of forest in this region. They are sometimes caused by lightning, and when once started, burn with surprising rapidity, travelling as quickly through the dry, white reindeer moss as over the grass of the western prairies. The Indians too are often accountable for these fires, most of which, it is likely, have been started by them, as they use smoke for signalling from great distances. Islands in small lakes are usually fired for this purpose, but brands are often carried by the wind to the mainland, and thousands of acres burnt over in a short time, the fire continuing until the first heavy rain and often breaking out afresh when dry weather again sets in. At times the Indians purposely burn large areas in order to prepare the ground for bear-hunting; for within a few years after a fire, in this region, the surface becomes thickly covered with blueberries and other small fruits, forming feeding grounds for bears during the autumn months.

Climate.

The climate at Nichicun does not permit the growth of grain, and in the small patch of land under cultivation at the Hudson's Bay post, only potatoes are grown, and these rarely if ever ripen properly, the tops being frozen early in September, or even in August. Summer frosts are also common and often severe.

Trees.

The following information concerning the trees and shrubs about Nichicun was obtained from Mr. Jos. Iserhoff, who is in charge of the Hudson's Bay post there. Black spruce is found on the shores and islands of the lake in abundance, and trees that will square six or seven inches for twelve feet, are not uncommon. White spruce is not plentiful, and is seen only in certain places along the sides of the lower hills. Balsam fir is common, and is found everywhere near the water, some of the trees growing as large as the black spruce. Banksian pine is very rarely seen, its eastern limit being defined by a line drawn nearly north-and-south through the Long Portage, beyond which line to the eastward, only a few straggling trees are found, while on the west side it is very abundant. White birch is common about the sides of the small hills, especially where fires have passed long ago; but no trees of a size sufficient to afford bark for canoe-building are found in the vicinity, and all the bark is supplied by way of Hudson Bay. Although common about Lake Nichicun, a short distance to the north and north-east, it is very rarely met with. Small straggling aspen and mountain ash, found in little clumps at wide intervals, complete the list of trees of this interior portion of Labrador. Small fruits are very abundant, but the prevalence of early summer frosts seldom allows the fruit to ripen.

Size and outline of Lake Nichicun.

Lake Nichicun is 1760 feet above sea-level, and is a very irregularly shaped body of water, with numerous deep bays. It is so plentifully strewn with islands, that it is difficult to form an idea of its size; many of the islands are large, and one, Big Island, is six or seven miles long and about two miles wide. The greatest length of the lake is from east to west, about thirty miles, and at the western end a narrows continues on into Little Nichicun Lake, which extends several miles farther. At its widest part the lake does not exceed ten miles across, and it is so obstructed with islands there, that it appears much less. The average width is about five miles. The numerous long points stretching out from both sides, together with the islands, make it almost impossible to pass through the lake without great loss of time unless with a guide. One of its deep bays, to the south-west, heads within a short distance of the river, near the portage from Crooked Lake, and advantage is taken of this to pass the rapids in the river when travelling from Nichicun to the East Main River. The shores are low and covered with rows of boulders shoved up by the ice. The country surrounding the lake is rough, and covered with numerous ridges of boulder-clay. To the north-west, north and east, there are high rocky hills rising from 300 to 600 feet above the lake. The islands are mostly portions of boulder ridges, but some of the larger are high and rocky, especially Big Island. The water is very clear and moderately cold. As a rule, the lake is not deep and in many places it is quite shallow, with large boulders rising above the surface. It discharges on its east side, the river flowing out by three channels. The two southern ones soon join, but the northern channel does not unite with the others for nearly fifty miles, or until the river changes its course from north-east to westward.

Nichicun Hudson's Bay Company post.

The Hudson's Bay post is situated on an island a short distance from the inlet of the lake. This post has been long established, probably before the beginning of the present century. No record of the date is known, but in 1840, a Mr. John Spencer was in charge, and made a sketch map of the surrounding country. At that time an outpost was situated at Lake Kaniapiskau. The map is now in the office of the Geological Survey, and is very interesting, as it shows the watershed between the St. Lawrence, Hudson Bay and Ungava Bay. At present the post consists of five small log buildings : the master's house, two servants' houses, a small store, work-shop and powder magazine.

Canoe route to Hudson Bay.

The supplies for the post are brought in from Rupert House by three large canoes, each manned by six Indians. In order to reach Nichicun in time to prepare for winter, the canoes leave the lake at the first open water, or about June 15th. The trip to Rupert House is made by the route to the East Main River, down it to a small lake called Nasaskauso, thirty miles below where the route to Mistassini turns off. From this lake a portage-route through a long chain of lakes is followed, and the Rupert River reached a few miles above Lake Nemiskau, about 100 miles above Rupert House, the river being descended to that place. The total distance from Nichicun to Rupert House, by the route followed, is somewhat over 500 miles. It takes two weeks to go down with the canoes partly loaded with the furs taken during the previous winter, Rupert House being reached about July 1st. Three or four days are spent there, and then the return trip up stream is commenced, and by working throughout the long summer days, from daylight to dark, Nichicun is again reached between the 15th and 30th of August. On leaving the coast, the canoes are loaded down to the gunwales, but before their destination is reached over a quarter of their loads are consumed. This gives some idea of the difficulty experienced in supplying an inland post like Nichicun.

Sustenance of the inhabitants.

Sufficient provisions cannot be brought in to support the people at the post, who have thus to depend largely on the country for food. During the summer they subsist almost wholly on fish, caught in nets in the lake, and are often for months without small luxuries such as tea, sugar and tobacco. During the winter the living is better, for then, besides the small rations of flour and other provisions, they are able to obtain abundance of fresh meat. About a dozen caribou are killed by the people of the post during the year, besides beavers, musk-rats and bears. Usually rabbits and ptarmigan are abundant during the winter season, and are shot and snared as required. In some years, however, both rabbits and ptarmigan are not plentiful, and caribou are scarce. During such seasons the food supply is very limited, and great care must be taken to prevent starvation, especially as the Indians are affected by the same circumstances and flock to the post for relief. A supply of salt fish is laid in, every autumn, in case of need. The fish are principally whitefish and lake trout, caught with nets late in the autumn on the spawning grounds in various parts of the lake. The articles of trade in the store embrace small quantities of cloth, clothing, tea, sugar, tobacco, powder and shot. Fish.

There are about thirteen families of Indians who trade at this post, but this does not represent all the people inhabiting this portion of the interior, as a number of families prefer to descend to Rupert House and trade there, bringing in their year's supply themselves. Others living to the southward, who formerly traded at Nichicun, now descend the rivers flowing into the Gulf of St. Lawrence, and do their trading at Bersimis, Seven Islands, or elsewhere along the north shore. Indians.

These Indians belong to the western Nascaupee tribe. They speak a dialect closely resembling that of the Montagnais. The men are of medium height and fairly good physique. Some are tall and well developed, but the average height does not exceed five feet seven inches. Like other Indians they are sinewy rather than muscular. As a rule, they are less cleanly than the Montagnais, taking little care of their clothes or persons; and they generally swarm with vermin. Owing to the small numbers of caribou killed in this region, the natives are forced to clothe themselves in garments bought from the Hudson's Bay Company. They live in wigwams covered with cotton, as they cannot get either the deer-skin used in the north or the birch bark covering of the south.

The hunting grounds of the Indians of Nichicun extend from the height-of-land on the southward, to the head-waters of the Great Whale River on the north. To the eastward they hunt as far as Lake Kaniapiskau and down its discharge about fifty miles. There appears to be quite an extensive area between their eastern boundary and the western limit of the hunting grounds of the Hamilton River Indians, who trade at Northwest River post. There is also a large area without hunters on both sides of the Koksoak River, from where the Nichicun Indians leave off, to where those from Ungava begin, as no signs of Indians were seen along that stream for nearly 200 miles. The greatest number hunt to the westward of Nichicun, or about the head-waters and tributaries of the Big and East Main rivers. Hunting grounds of Nichicun Indians.

The presence of a trading post in the interior of Labrador, such as that at Nichicun, is at present absolutely necessary to the Indians inhabiting that region, and it is doubtful if the country would support half the present population without it. In seasons of plenty it is not necessary, the Indians transporting their furs to some point on the Necessity of a trading post in the interior.

coast, and returning inland with their next season's supply, but in seasons of starvation, without the aid furnished by the post, a majority of the people would die. The greatest number of deaths from starvation occur about the Rupert and East Main rivers, in the country midway between Nichicun, Mistassini, and Rupert House, where the distance is too great from any of these posts to obtain assistance during the winter. So great has been the mortality in this region, during the last few years, since the extermination of the caribou there, that the country is nearly depopulated, and a supply of provisions is kept by the Hudson's Bay Company at Lake Nemiskau on the Rupert River, to relieve the Indians in extreme cases of necessity. From the above, it will be seen, that although at present the population of the interior is small, it appears to be in excess of what unassisted nature would sustain with the present habits of the Indians.

Education and religion of the Indians.

The Indians of Nichicun all read and write the syllabic characters invented and taught by the missionaries of the Church Mission Society, and letters written on birch bark with charcoal are commonly seen on the portages along the various routes. The missionaries have also a number of books printed in these characters, including a selection of hymns and almost the whole of the Bible. These books are greatly prized by the natives. Although nominally Christians, their religion is greatly mixed with pagan ideas, and as their opportunities of acquiring a knowledge of Christianity is limited to the short stay every summer at Rupert House, it is no wonder that they retain many of their old beliefs. The visit to the coast is the occasion for the celebration of marriages and baptism.

Route from Nichicun to Lake Kaniapiskau.

Big River below Lake Nichicun.

We left Lake Nichicun by the middle discharge, on August 5th, 1893. The general direction of the stream is north-east. For two miles, to the first portage, its breadth varies from 50 to 300 yards, with swift water in the narrows. The shores are very irregular and are made up of low ridges composed almost wholly of large boulders, with little fine material. Along the river and in the small bays, are distinct traces of a terrace twenty feet above the present water-level. When the lake stood at that height, it must have covered an area nearly twice as great as it does at present, extending over a great deal of land now dry, more especially to the south and south-west.

The first portage is on the north side, following along the summit of a low ridge for 300 yards. The river here falls eight feet over a rocky ledge. Two other short portages in the next two miles pass similar small falls over ledges of rock. The third portage terminates in a bay of a small lake-expansion, the river taking a short turn toward the north and falling into the lake about half a mile beyond the portage. The next portage is three miles below, the river in the interval varying from 50 to 800 yards in width, with numerous small deep bays running off on either side. Into one of these small bays the south discharge falls. The portage crosses a narrow point, around which the river, greatly enlarged, rushes in a heavy rapid, obstructed by many huge boulders. On both sides of the river here are sharp rocky hills rising from 400 to 500 feet above the water. Below the hills the valley widens out, and the surrounding ridges are low, with isolated rocky hills rising at intervals above them. For the next eight miles the course is north, and the river alternates from rapid narrows to small lake-expansions covered with little islands and broken by narrow deep bays. In the narrows, the river breaks into small rapids full of boulders, and has a strong current even in the widest expansions. A small lake is then entered with the river passing out to the north-west. The route crosses the lake and goes up a narrow bay for one mile and a half to its head. From here a portage of 400 yards leads to a small lake two miles long, surrounded by steep rocky hills 300 feet high. This lake is left at its east end by a half-mile portage, to another small shallow lake one mile long, surrounded with lower boulder-strewn hills, followed by another portage, a quarter of a mile long, that ends in Square Rock Lake, seven miles long, but very narrow, the average breadth being 400 yards, with small expansions at both ends and in the middle, where a small branch of the Big River flows out on the north side.

Character of river and surrounding country.

Square Rock Lake.

The lake is surrounded with hills from 200 to 400 feet high. These, like most of the country from Lake Nichicun, are burnt, and their exposed sides often appear from a distance to be solid rock, but on close examination they are found to be made up of angular masses and boulders, closely packed together. Where the forest remains, it consists almost wholly of small black spruce, with a few larches on the lower ground, and very small white birch on the hillsides. A few white spruce trees are seen growing on the low sandy terraces about the lake. The route leaves Square Rock Lake by a small stream flowing in on the south side nearly one mile from its east end. This stream comes from the eastward, in a wide valley, now filled with modified drift arranged in beds of sand and gravel, which appears to have once been the bed of a much larger stream than the present. The stream is ascended for four miles, passing on the way two short portages, where the river falls in shallow rapids from one expansion to another.

Trees.

The last portage ends in a lake four miles long and about half a mile wide, strewn with small islands of till, or stratified sand. There is evidence of a terrace twenty feet above the present water-level, and there is a good deal of stratified sand and gravel seen along the shores. High rocky hills rise from either side of the broad valley partly filled by the lake. These hills have been more than three-quarters burnt over recently, and have a very desolate appearance. The trees are somewhat smaller than those seen about Nichicun, but they still grow up to the summits of the highest hills. A short portage leads to another lake, to the eastward, a half mile up which another portage is made past a shallow narrows; then the lake widens out and continues eastward for two miles. The hills on both sides are high and are burnt bare; the boulders, having been whitened by the action of the heat, stand out in marked contrast to the blackened vegetation. A portage of 400 yards leads to Eagle Lake, on another small branch that flows into the Big River, some distance below. This river is now divided into numerous channels by large rocky islands, which thus form a net-work of lake-expansions over a wide area. Beyond this place the route is very difficult to follow, passing as it does through chains of lakes filled with islands, with deep bays branching off on both sides. The route in some places leaves the main lakes, passing by shallow narrows into large bays. The dividing up of the river into various channels, that often do not join for several miles, also leads to great confusion. Even with the aid of a map of the route, much time will be lost in following it here, owing to the sameness in appearance of the lakes and bays.

Eagle Lake.

Crossing Eagle Lake, to its east side, one mile, the north channel of the branch is ascended one mile to Snipe Lake. Betweeen the lakes the river is rapid and varies from ten to fifty yards in width. The latter lake is two miles and a half long by three-quarters of a mile wide, and runs northward, with a narrow bay stretching to the east for a mile from its north end. A south channel leaves the lake in a bay about one mile above the other outlet. The river again divides, giving two inlets to Snipe Lake with a large hilly island between. The lake is covered with small islands. Many of the surrounding hills are rocky and precipitous, well wooded on the south side, with many blocks and boulders scattered over them. The route follows the narrow bay to the north-east. A portage of three-quarters of a mile leads from it to another lake-expansion of this branch, eleven miles in length, which is called Long Lake, and lies about N. 60° E. It is very shallow and full of small islands, while great areas are obstructed with boulders and angular blocks of rock resting on the flat, shallow bottom. Many

Snipe Lake.

Long Lake.

irregular bays indent the shore, especially on the north side where the land is low. The river flows out at the south-west end, and must be broken by a considerable fall, as the sound of it is heard well up the lake. Several small streams feed the lake, the largest flowing in on the south side. The surrounding hills are rocky and burnt over, and are lower than those about the last lake. They gradually sink towards the east end, where the country is appreciably flatter and lower, with many lakes separated by low ridges.

Two short portages and a narrow lake one mile long, lead to a lake surrounded by low, rocky, boulder-strewn hills, and stretching towards the north-east. The route passes only two miles through the west end of this lake, and up a small irregular bay to the northward. Here a portage of 500 yards ends in a small lake twenty feet above the level of the last. Half a mile beyond, another short portage is made to the last lake on the head-waters of the Big River. The route merely crosses this lake, which is large, and stretches away to the north-east, and then passes for 500 yards over a low ridge of boulders, forming the height-of-land between the rivers of Hudson Bay and Ungava Bay. The portage ends in a very large, irregular lake thirty feet below the last.

Watershed between the Big and Koksoak rivers.

From the watershed, the route runs northward for six miles, in an irregular course, through Ice-bound Lake. This is another large body of water with wide, deep bays stretching off to the north-east and south-west. The water is very clear and shallow. The east side is bounded by rocky hills about 200 feet high, while to the westward the land is low, and is probably made up of points and islands in this, or in similar lakes, in that direction.

Male-otter Lake.

A small stream flows eastward, from the north side of the lake, and the route follows it for six miles to Enchukamao or Male-otter Lake. The character of this stream is similar to that of others in the region, consisting of small, irregular lake-expansions, connected by short rapids, with portages past three of them. The surrounding country is comparatively low; rocky hills are seen to the eastward 200 or 300 feet high; the rest are much lower, and are composed of till. Where unburnt, the country is covered with small, scattered, black spruce, with white moss coating the ground. Male-otter Lake stretches eastward eight miles, and varies from two to five miles in width. At its east end it is split into two deep bays by a broad rocky point, that rises about 500 feet above the lake. The summit of this hill is destitute of trees and is covered with white moss. Islands are numerous, and are generally well wooded with small black spruce.

On the south side bare hills of granite rise often perpendicularly from 300 to 400 feet, while similar hills bound the north side, but appear to be somewhat lower. Both sides have been burnt bare, causing the scattered boulders and blocks that cover the hills to stand out prominently. Along the base of the hills, on the south side, there is a sandy terrace fifteen feet high, marking a former level of the lake. The water is remarkably clear ; this is the case with all the water north of the East Main River, and is probably due to the lack of vegetable decomposition in the swamps and small shallow lakes, which to the southward gives the water a dark-brown colour. To the northward decomposition does not take place, at least it is not appreciable, on account of the short summer season during which the heat is insufficient to warm the cold waters fed by streams from the swamps that thaw out only on the surface, to a depth of twelve to eighteen inches.

Character of surrounding country.

Male-otter Lake discharges by a short stream from the head of its north-east bay into Lake Kaniapiskau. The route passes up the south-east bay, to its head, whence a portage of one hundred yards, over a low ridge, leads to the great lake. The difference of level is ten feet.

Lake Kaniapiskau.

Lake Kaniapiskau.

Lake Kaniapiskau is probably the largest in this part of Labrador. Its greatest length is from north to south, and is said to be considerably greater than that of Lake Nichicun, or above fifty miles. The lake is divided into two parts by a narrows, where the current is said to be strong. The southern part is much the larger. As the route passed only through the northern portion, nothing is known of the lake above the narrows, except from information derived from the guide. A high rocky point stretches out from the east side of the northern part, and along with some islands in continuation of it, practically divides that portion of the lake into two great bays.

Height above sea-level.

From the hill on this point, 300 feet high, a good view is obtained, but unfortunately the smoky state of the atmosphere obscured it when we were there. From the hill, the south bay is seen extending about ten miles to the base of a conical hill of granite over 500 feet higher than the level of the lake, which is estimated to be 1850 feet above the sea. This hill cuts off the view of the southern portion of the lake. To the westward a deep wide bay stretches towards the south-west to the foot of high hills in that direction. Northward from that bay, a lesser one runs close to Male-otter Lake, where the portage is. The lake-shore then sweeps eastward along the point, which extends about five miles in that direction. The bay on the north side of the point extends to the north-westward about five miles, where the river from Male-otter Lake comes in. Near here the Hudson's Bay Company formerly had an outpost from Nichicun, but it has been abandoned for over twenty-five years. Another deep bay extends to the northward, with a channel flowing out of it, between low rounded hills.

East shore of Lake Kaniapiskau.

The east side of the lake is less irregular in outline, but a wide fringe of low islands extends from its north end to the narrows, with the river passing out by two channels, one opposite the point, and the other a few miles to the south. The country to the east of the lake is much lower than that on the other side, and consists of low rocky ridges, with wide valleys between, filled with lower ridges of till. The north end of the lake appears to be shallow, and is filled with islands, as is the case with the eastern half of the south bay. The western part of the latter is almost free from islands, and is said to be very deep. The islands about the southern discharges are arranged in parallel lines running north-east, and are chiefly composed of till, with many large boulders. Some are made up of stratified sand, which is also often seen resting on the till. The surrounding country is more than half burnt. The lower unburnt portions and islands are well wooded with small black spruce and a few larch trees. The summits of the high hills along the west side rise above the tree-line.

Koksoak River.

Headwaters of the Koksoak River.

The largest stream falling into Lake Kaniapiskau flows in at its south end. Its main branch rises in Summit Lake, a body of water situated on the watershed about 100 miles south of the latter. A curious feature is that it has a discharge at each end, the northern one flowing into Ungava Bay, while the southern one, is a tributary of the Manicuagan River, that empties into the Gulf of St. Lawrence. This is not an uncommon case with lakes situated along the watershed in the northern region underlain by Laurentian rocks. The river flowing north from Summit Lake is joined by many other streams, draining the lake-covered region to the south and south-east of Lake Kaniapiskau, so that the river where it flows into that lake, is of large size.

Double discharge of Summit Lake.

Three outlets to Lake Kaniapiskau.

As before stated, Lake Kaniapiskau has three discharges, and the route follows the middle and least rapid one. Where it leaves the lake, the channel varies from 50 to 200 yards in width; it flows swiftly, and is soon broken by a succession of heavy, shallow rapids, full of great boulders, the channel being cut in boulder-clay. These rapids are almost continuous for five miles, and no rock is seen in place. The south channel joins the middle one a mile and a half below the lake, and, just above the junction, makes a very heavy rapid. Below the junction, the river is 200 yards wide, and carries about twice as much water as above.

Character of the river below Lake Kaniapiskau.

Below the rapid, the river, flowing north, widens out into a shallow lake four miles long and about one mile wide, with two deep bays on the west side, into one of which the north channel is supposed to empty. Northward of the lake there is a range of hills, partly wooded, while in other directions the hills are isolated and the country covered with low ridges of till. Boulders are still common, but not nearly as obtrusive as in the region west of Kaniapiskau. Leaving this lake the river narrows to a quarter of a mile, and is broken for a mile by a small shallow rapid; then, narrowing to 100 yards, it flows swiftly for another mile to a second lake-expansion. Here, widening to three-quarters of a mile, the river continues northward for two miles in a shallow channel full of sandy shoals and small islands. These islands have a thick growth of stunted trees, not over ten feet high, of black spruce, larch, balsam fir and white birch. A straggling growth of spruce covers the low hills on both sides. Next, turning north-west, the river continues in the same manner two miles and then passes into a large lake, full of islands, that extends eastward. Where the river turns east, there are two distinct terraces of stratified sand twenty and thirty feet high, with sharp conical hills of boulder-clay protruding from the highest. Along the west shore of the lake three miles, a narrows 500 yards wide is passed, leading into another lake-expansion three miles long and over a mile wide, with a deep bay toward the east. The country here is almost flat, with low hills along the eastern horizon. The river now turns northward again, and for the next three miles flows rapidly in a shallow channel about 400 yards wide, with swampy shores backed with bare hills, less than 200 feet high. Another lake-expansion, one mile across, is followed by a stretch of three miles of river ending in a lake that extends away to the westward. Passing along its east shore, the river flows out one mile beyond its entrance. Now narrowing to 200 yards, it flows rapidly north-east for two miles, then widens to 500 yards for two miles, and, bending to the eastward, flows in that direction for three miles; at two short narrows it is broken into heavy rapids where it passes over low rocky ledges. With the exception of one small hummock, this is the first rock seen below Lake Kaniapiskau, but judging from the scattered

Character of surrounding country.

boulders, the rocks underlying the thick deposits of drift are likely to be soft mica-schists and mica-gneisses, and this accounts for the change in the character of the country. These soft rocks having been unable to stand the abrading action of glacier ice, have been planed down, and only the harder parts rise in the low isolated ridges seen here. The granites of the region west of Kaniapiskau, being much harder and tougher, resisted the glacial action, and now stand up in the rugged hills previously mentioned.

Absence of rock.

The river below is split into two main, and a number of smaller channels, with the stream in a shallow channel almost on a level with the surrounding flat country. Our route followed the east channel, which flows north-east four miles, and then north four miles, to the head of a heavy rapid. Two large channels join it at the fourth and eighth miles, and there is a heavy rapid between the second and third miles, with a large rocky island dividing it. When again united, the river runs north-north-east for five miles, and flowing on the surface over low, flat ledges, is almost a continuous rapid for the whole distance. Throughout, the breadth is 400 yards. Three short portages are necessary to pass low chutes.

Turning due east along the southern flank of a low range of hills, the river next narrows to less than 300 yards, and flows swiftly between rising banks of till, with outcrops of rock along the shore. Now bending east-south-east for three miles and then south for two miles, the stream narrows to less than one hundred yards, and descends in a narrow valley, cut out of till, with a rocky bottom. On the north side, the hills increase in height as the river descends below the general level, and at the lower end rise abruptly 500 feet above the stream. Those on the south side are somewhat lower. In the five miles, the river falls over 150 feet, and is very difficult to pass with canoes. The Indians of Nichicun hunt only to the head of these rapids, and below there is an interval of over one hundred miles of the river untravelled, as it is utterly impossible to ascend the stream with loaded canoes. Along this portion no portages are cut out past the falls and rapids, and in consequence portage-roads had to be made by us. At the rapid above, the sides of the valley are composed of almost perpendicular walls of till one hundred feet or more in height, resting upon jagged rocks covered with great rounded boulders for thirty feet above the water-line. These boulders are piled up by the ice passing through the gorge in the spring. The till banks at frequent intervals are deeply cut by small tributary brooks. On account of the broken character of the bank above, a portage had to be made along the water's edge over the loosely piled boulders and jagged rock. The

First gorge of the Koksoak.

Walls of packed boulders.

river is here so rough, that the outfit had to be carried the entire five miles, and then the empty canoes were let down along the shore with frequent short portages past heavy pitches. A day and a half of hard work was necessary to accomplish this.

Character of the river above the gorge.

From Lake Kaniapiskau to the head of the gorge, the river wanders about almost on the surface of the country, spreading out into lakes, where the surface is flat, and contracting into narrow rapids where it passes between low ridges. It follows the main slope of the country, and falls with the general surface. Where it is obstructed with rapids, these are frequently over boulders without any rock in place, especially along the upper parts. The absence of a distinct valley and the presence of rapids over boulder-clay, show that the river is here flowing in a modern course, and does not follow its pre-glacial valley, which is still filled with glacial débris. At the gorge, this changes, and the river passes down from the general level into a deep distinct river-valley, probably of very ancient origin. This valley, during the glacial period was at least partly filled with till, which in scarped banks and terraces is seen along it, resting on its rocky sides. The river follows this old valley from the gorge to its mouth. The valley is, of course, not of constant depth, but descends in a series of steps, with the gradual slope of the surrounding country.

River below the gorge.

From the foot of the heavy rapid, the river, now in a distinct valley, takes an easy bend to the east and flows in that direction for eight miles. Here the current runs from four to seven miles an hour, with constant small rapids. The river averages 200 yards in width, and descends in a valley from a quarter to a half mile wide, walled in by steep rocky hills that rise 500 to 800 feet above it. These hills are almost wholly burnt, but where unburnt are covered with a straggling growth of black spruce to within 200 feet of their highest summits. The tops are treeless, and are covered with white moss and low arctic shrubs. Boulders are now nearly absent from the sides and tops of the hills, in strong contrast to the hills about Nichicun and Kaniapiskau. Some boulders are seen, but they are so few as not to form a noticeable feature.

The lower parts of the valley are filled with drift, often extending high up the rocky hills in the cuts between them. In the drift the river has cut its narrow channel down to the solid rock below. The rock, where not covered with packed boulders, is seen along the water's edge. In many places the river-banks are formed of tightly-packed, large, round boulders, that line the side to a height of fifty feet above its summer level. These have been transported and packed in their present position by the ice passing down during the spring freshets, and their height gives an idea of the volume and power of the stream during flood time.

Turning south-east, the river continues in that direction under similar conditions for three miles; then it turns east-north-east, and the valley and river both broaden. The river, now a quarter of a mile wide, flows in a perfectly straight course for nine miles. Owing to its greater width, the water is very shallow, and the continuous rapid is full of bouldery shoals; the deepest channel being very crooked, requires constant crossing of the stream to follow it. No part of the rapid is rough enough to be dangerous, and the only source of danger is the frequent shoals, on to which the swift current quickly carries a canoe, if a sharp outlook is not kept. The packed boulders still rise from thirty to sixty feet above the water, with stratified sand and fine gravel, up to seventy feet, where a distinct terrace is seen, marking an older level of the river. Along the margin of the water there is an almost continuous exposure of solid rock. The hills are less precipitous, especially on the west side. The valley is filled with drift, of which sections are seen along the banks. The river now turns north-east for four miles, and broadens slightly, the rapids giving place to a strong, steady current of nearly six miles an hour. A mass of ice, twenty-five feet long and six feet thick, was seen at the bend on the north side, piled up on a great quantity of packed boulders, sixty feet above the water, the remains of a great mass shoved there by the freshet in the spring, and left by the receding water. But a short time before, it had covered an area of over 100 yards square, but at the time (August 16th), it was melting quickly. Similar masses were seen along that shore for a mile below; they were all about thirty feet above the level of the water, and the largest was 200 feet long by thirty feet wide.

Continuous rapids.

Ice on banks.

Both shores remain rocky, the rock coming out from beneath the packed boulders. On the west side, near the lower end of the course, there is a well marked terrace, seventy-five feet above the water, that is seen extending downwards for two miles. In places it is flanked by a lower one forty feet high, with the boulders often packed to the top of it. The hills forming the sides of the valley are now about 500 feet high, and this nearly represents the height of the surrounding country, as all the little streams entering the river do so with falls from small cuts slightly lower than the summits of the hills. From the head of the rapids at the gorge, to this place, the river has fallen 420 feet without any direct drop exceeding four feet. The grade is nearly constant, and exceeds ten feet per mile.

Valley much lower than surrounding country.

The river next once more bends to the southward, and flows south-east for six miles, with a strong current, in a slightly wider and lower valley. A large brook comes in from the eastward at the fourth mile.

Trees.

For the last twenty miles the country on both sides is unburnt, and is covered with scattered black spruce and a few larches, never more than twenty feet high or exceeding nine inches in diameter. The tops of the hills rise from 100 to 200 feet above the tree-line. Turning again directly east, the river flows in that direction for six miles. The channel along here is wide and shallow, being filled up with sand and fine gravel, borne down by the strong current above and deposited over the flats of this part. Sandy shoals rise slightly above the water in places. The hills on both sides are slightly burnt and are lower, with gentler slopes towards the river than those further up stream. Rock-exposures are less numerous, and the ice does not bank the boulders on the shores to more than fifteen or twenty feet high.

After a bend to the east-south-east, a small rapid is passed, and three miles below a little river falls in on the south side. This is the first tributary of any considerable size that joins the main stream below the commencement of the river-valley proper, and there must be only a narrow strip on either side draining into the river, the rest of the country probably being cut up into parallel valleys, with watercourses in each, which only join the main stream at long intervals. The small branch comes in with heavy falls, along the side of a rocky hill of 800 feet. Below, the river again flows eastward for three miles, with a strong current, and has a terrace of thirty feet on the south side. A bend of a mile and a half to the north-east is followed by another long stretch to the eastward. A heavy rapid, four miles long, begins at the upper part of the north-east course. Then the channel broadens somewhat, and the current is considerably slacker for the next eight miles. The valley here slopes gently upward, on both sides, and is partly filled with drift. The hills are high, those on the south side rising from 600 to 800 feet, with well marked terraces at sixty and thirty feet, cut out of the drift along their flanks. The north side is unburnt, and the trees are all small, stunted black spruce, that grow to within 200 feet of the summits.

Parallel valleys.

The general course for the next ten miles is east-north-east, and, the valley narrowing, the river for the first six miles is a succession of heavy shallow rapids, full of boulders. Along the flanks of the hills on the south side, several distinct high-level terraces are seen at 30, 60, 75, 100 and 150 feet above the present river-level. The upper ones are broken, and only the lowest two are continuous. Below the rapids the river widens to more than half a mile, and is correspondingly

River terraces.

shallow, with a sandy bottom. The hills on both sides now gradually lower, and those on the south side retreat, leaving a wide, low, drift-covered valley between their base and the river. A bend of two miles to the south is followed by a stretch towards the east five miles long. At the foot of the first bend there is a rapid of three-quarters of a mile where the river is over half a mile wide, and is in consequence very shallow. Below this rapid the river is nearly a mile wide, and flows with a strong current until it reaches the base of a low range on the north side, where it narrows to 400 yards and is broken into heavy rapids. The river now appears to break through this low range 200 to 400 feet high, and in doing so bends sharply to the south-east for two miles, then north-east two miles, again south-east two miles, and finally south for three miles, passing out into a broad valley, where it is joined by the Katakawamastuk or Sandy River, a large branch from the eastward. While passing through the hills, the river forms a continuous strong rapid, culminating in a twenty-foot chute a short distance above the forks. Although the river descends rapidly, it does not fall as quickly as the general level of the country here, and, in consequence, below the forks it flows nearly on the general level, with only low rounded hills seldom more than 100 feet above its shallow valley. Sandy River.

In this manner it flows eastward for five miles, with only one small rapid, to the head of a rocky gorge. From the head of this gorge a very distinct drop is seen in the country to the eastward, with high hills that appear to be on the level with the land about the gorge bounding the horizon. At the head of the gorge the river is split up by little rocky islands into a great number of small channels, and it passes through them in a succession of small chutes or heavy rapids, gradually collecting into one channel; after half a mile, the stream, a mass of foam, rushes down a narrow gorge from thirty to one hundred feet wide, with perpendicular rocky walls from 50 to 100 feet high. In one mile the river falls 110 feet without any direct drop of more than five feet. The portage passes over the bare rock on the south side. Below the gorge, the channel widens to half a mile, and continues eastward, with strong current and flat rapids for three miles. Here again narrowing to 100 feet, it falls thirty feet into a narrow rocky gorge, which was named Eaton Cañon, and turning directly south, rushes down between jagged perpendicular walls with a width varying from fifty to one hundred and fifty feet. As the stream descends, the banks rise and become 200 feet high a quarter of a mile below the first fall. Here the river turns sharply to the north-east and continues as a rushing torrent, through a deeper and still Second gorge. Eaton Cañon.

narrower gorge, with overhanging walls of red granite on the east side. The overhang is so great, that a stone dropped from the top on this side would almost reach the foot of the opposite cliff when it struck the water 350 feet below. After falling in this manner for a third of a mile, the river widens to a hundred yards, and changing its direction to east, descends less abruptly for a quarter of a mile, while the walls of the cañon are a hundred feet lower, and much less abrupt. Next, turning north, it makes a direct fall of a hundred feet into a circular basin about fifty yards in diameter. Nothing but seething water and foam is seen in this rocky basin, which resembles a gigantic boiling cauldron. A small brook, on the north side, also falls into the basin, descending the perpendicular wall in a cascade 200 feet in height. The river leaves the basin by a narrow rocky channel, rushing out with a fall of thirty feet in immense waves that gradually subside in a second and larger circular basin at its foot, where it widens to 150 yards. On each side of the central current there are strong eddies rushing up to join the down stream, where it passes out from the basin above; and, where the conflicting currents meet, great whirlpools are periodically formed. A small rocky island divides the river into two narrow channels where it leaves the larger basin, whence it flows north-east for two miles, and then gradually bending south in the next mile and a half, still a hundred yards wide, it rushes along in heavy deep rapids, between vertical walls of granite capped with drift that rise from 100 to 300 feet above its surface, until it suddenly bursts out into a wider valley running north-north-east, with a large branch called Goodwood River flowing down it from the southward.

Goodwood River.

Portage past Eaton Cañon.

The portage past the cañon was made along the east side, leaving the river above the first fall, coming out on the top of the bank at the sharp bend to the north-eastward, and thence striking due east for a mile over low rocky hummocks, with swamp between, and descending the steep rocky course of a small stream to a narrow valley 200 feet below. It then follows this valley for half a mile to a small lake, after crossing which a portage of 150 yards leads out through a narrow gorge, with perpendicular walls 160 feet high. Large masses of rock have fallen from above and have filled the valley completely to a depth of seventy-five feet. The small river passes under this mass of broken rock, and in so doing falls twenty-five feet, to where it enters the main stream on the south side of the larger basin at the foot of the cañon. Over this mass of broken rock canoes and outfit were carried, as there was no other place where the main valley could be entered, and the difficulty of the undertaking may be imagined when it is stated that over half a day's labour was required to pass these 150 yards of broken rock.

In the small valley, the trees are much larger than any seen since leaving Lake Mistassini. Growing on a rich alluvial soil along the banks of the brook, is white spruce eighteen inches in diameter at the ground and sufficiently long to make two twelve-foot logs. The trees are, however, very knotty. Larch of similar size is also seen here, along with white birch eight inches in diameter. The first white spruce on the banks of the river was found on a low bank of sand and gravel at the mouth of the Sandy River. Below that point, small trees of this species are commonly found growing on the lower terraces of stratified drift. The higher lands support only a small growth of black spruce and a few larches. Large trees.

Below the junction of the Goodwood River, the main stream runs north-north-east for six miles, with a rapid current, in a channel 300 yards wide. On the west side there are scarped banks of stratified drift one hundred feet high; and rocky shores on the east side are capped with drift and have two well-defined terraces at 60 and 100 feet above the river, the lower terrace being cut in fine sand and grown over with fair-sized white and black spruce. Four or five miles beyond the lower end of this course there is on the east side a range of bare rocky hills over 1000 feet high. Widening out to nearly half a mile, the river then turns north, and for fifteen miles flows with a moderate current in a shallow channel filled with sandy shoals. The eastern bank is very rocky, and from 200 to 300 feet high, with patches of sand along the gulleys where the brooks tumble in. These rocky banks form the foot-hills of the barren range before mentioned. The west side has also high and in many places rocky banks, but the country behind is much lower than on the other side, with a few isolated hills more than 500 feet high. On this side the surface is mostly unburnt, with fair-sized black and white spruce and larch growing on the stratified sands of the terraces, but with only a scant, straggling growth of black spruce on the rocky and drift-covered hills above. River below Goodwood River.

Remains of terraces are seen along both sides at 10, 60 and 75 feet, that at 60 feet being the most constant. Contracting now to less than one hundred yards in width, the river falls eighty feet over a ledge of rock at the Granite Fall. Two small rocky islands divide the stream into three channels, the largest being on the north side. There is a first chute of twenty feet followed by a perpendicular fall of sixty feet in the smaller channels. In the main channel, a large mass of rock broken away, is apparently lodged at the foot of the fall, as the water dashes up from below in a great wave forty feet high. The river falls into a beautiful, circular basin, nearly half a mile in diameter, formed by a deep semi-circular bay on either side. These Granite Fall.

bays are surrounded by well wooded, perpendicular cliffs 200 feet high. A wide beach of small, well rounded boulders, rises sharply from the water and stretches for sixty feet to the foot of the perpendicular walls.

Deep channel cut in drift.

Below the falls the river again passes into a deep valley less than a mile wide, with rocky walls that often rise sheer from 800 to 1000 feet. This valley during the glacial period has been partly filled with drift and the river has since cut into it a narrow channel, with high scarped banks of from 100 to 300 feet, with terraces from 50 to 150 feet above the present level. The direction of the valley is nearly north-west, and the river, about 300 yards wide, rushes down it in a zigzag. At every bend the stream strikes against the rocky walls, while a low bar of large, round water-worn boulders extends out from the opposite shore, throwing the waters with force against the rocky banks, and forming deep wild rapids at these points. In this manner the river continues falling rapidly for ten miles; then the valley gradually widens and there is a considerable interval of drift-covered land between the river and the rocky hills on the east side, where terraces at 20, 50 and 100 feet are seen, cut in the drift. The west side is still bounded by rocky hills, that rise about 400 feet. In the valleys of small streams cut into the drift, and on the terraces, white spruce trees forty feet high and eighteen inches in diameter are not uncommon.

This valley continues from three to five miles wide for twenty-five miles and is remarkably straight, the course being about north-west. The river skirts its west side, where it flows close to the base of the rocky walls, that rise from 200 to 400 feet above it. For seven miles it does not average over 400 yards in width, is very shallow and greatly obstructed by sand and shingle bars, over which it breaks into rapids. At the end of this stretch, a small river comes in from the west, through a deep narrow cut in the mountains. Terraces are continuous along the east side at heights varying from 20 to 150 feet above the river. Balsam poplar trees forty feet high and ten inches in diameter were seen on the lower terraces, along with white spruce trees sixty feet high and over eighteen inches in diameter.

Balsam poplar.

Below this branch, the river soon widens out to more than a mile, and is broken by sand bars into a number of wide shallow channels. The bottom is formed of shifting sands. The banks are lower and are composed of stratified sand cut into terraces. The current is slacker, and at the end of fourteen miles another and larger branch, called the Tipa or Death River, comes in from the west, joining the main stream by three channels, as it falls over a low ledge of gneiss. Below this tributary the river narrows somewhat, but still

Death River.

remains shallow, with lower banks, for four miles; then, narrowing to less than 400 yards, it bends to the northward into the head of Cambrian Lake, which is about two miles wide and surrounded by high rugged hills of Cambrian rock.

In fourteen miles, the lake gradually sweeps round from north to north-west, and at the end of the curve, another small branch from the west flows in from a wide valley between high barren hills that rise from 800 to 1200 feet above the water. Cambrian Lake.

The physical aspect of the country changes as soon as the Cambrian area is entered. Where the underlying rock is Laurentian gneiss or granite, the hills, though often high and with perpendicular sides towards the river-valley, always have rounded tops, with long gently curved outlines, while the hills formed from the stratified Cambrian rocks, are much sharper and more rugged. Character of the country.

The general dip of the rocks is towards the north-east, and, in consequence, the mountains which they form show steep cliff-faces towards the west, with long gentle slopes on the opposite side. These hills run in ridges roughly parallel to one another and to the general strike of the rocks, that is, from south-east to north-west. They rise from 800 to 1500 feet above the surface of the lake, which is about 400 feet above sea-level, and on the western side often have perpendicular cliffs over 500 feet high, with a great talus of broken rock at the bottom. The cliff-faces have generally a reddish colour, due to the oxide of iron present in all the rocks of this series. All except the lower slopes of these hills are barren, or covered only with arctic shrubs and mosses, with patches of snow in gullies near their summit; this adds greatly to the grand and desolate scenery, while the beauty of the pleasant, wooded valley of the river is enhanced by the contrast.

From the entrance of the small branch, the valley again turns northward, and continues in that direction for eleven miles, to where the lake gradually changes into the river again, with high hills on the east side, in which the Cambrian rocks are seen resting on rounded masses of gneiss. The hills on the west side retreat, leaving a wide sandy plain, through which a large branch called the Piachikiastook or Ice-dam River flows, entering the main stream with a heavy rapid two miles above the end of the course. The main stream gradually narrows, and becomes shallow along the lower part of this stretch, where it runs between low banks of sand. Turning next to the north-east for seven miles in a wide sandy valley, it flows along with increased current in a shallow channel three-quarters of a mile wide, until it reaches a barrier of black shale and limestone, Ice-dam River.

Shale Falls.

where it falls sixty feet in about 200 yards, at the Shale Falls. Below the falls, there is a circular basin with steep sandy banks sixty feet high, and from it the river passes out to the north, and flows in that direction for two miles between terraced banks sixty feet high covered with large spruce, with outcrops of iron ore showing beneath the sand along the water's edge.

Swampy-bay River.

Gradually bending around to the north-west, the river flows in that direction for twenty miles, until it is joined by a large branch from the eastward called the Swampy-bay River. By this stream, the Indians formerly travelled to Fort Nascaupee, which was situated on Lake Petitsikapau on the upper waters of the west branch of the Hamilton River, and only a few miles from the watershed separating it from the Swampy-bay River. Along the first five miles of this course, the river is about half a mile wide, and flows between sharp rocky hills, which rise 600 to 800 feet above it. Here an almost continuous exposure of bedded iron ores is seen, consisting of red and specular hematite, magnetite and sidertie, interbedded with siliceous limestones and jasper. After five miles, the hills retreat on both sides, leaving a wide valley of drift, through which the river runs with a steady current in a shallow channel half a mile wide. The drift is cut into terraces at 30, 50, 100, 150 and 300 feet. A small branch from the east flows in here.

After four miles the hills again approach the river on the west side, where they are sharp and rugged and rise from 600 to 800 feet in precipices often terminated in sharp peaks. Two miles above the forks there is a strong rapid half a mile long, where the river narrows to less than 200 yards. The sands in the valley are greatly drifted by the winds, and in one place the drifts are covering up trees twenty feet high. The country is nearly all burnt from the falls to the mouth of the Swampy-bay River.

Character of river below Swampy-bay River.

For eight miles below the Swampy-bay, the main stream flows north-west in a narrow valley, between sharp rocky hills, from 400 to 600 feet high. The river-channel is from 200 to 600 yards wide, and the current is strong. The lower parts of the rocky hills on the east side, are covered with sandy drift and are terraced at several levels up to 200 feet above the present height of the river. The hills on the west side rise directly from the water and have very little drift on their flanks.

The river next turns north-north-west for seven miles, and then north for seven miles more. Along the upper of these courses the valley widens to over two miles, and is filled with drift, terraced to the 200 feet level, behind which it slopes gently upwards with a few sharp rocky hills projecting above it. Along the second course the land on the east side is only about fifty feet high, for three or four miles to the base of the hills. The country on the west side is higher and the hills come out at intervals along the river, with a large brook flowing in from the west, about two miles from the upper end of the course. The river here widens out to nearly a mile, and its current is not strong.

Along the last mile, the river narrows to 400 yards and flows swiftly between hills of limestone from 200 to 600 feet high, very sharp and irregular in outline. The rock has the appearance of being greatly faulted. Turning now sharply to the north-east, the river continues to flow swiftly in a narrow, rock-bound channel for three miles, where it again turns northward, and continues in that direction ten miles to the Pyrites Chute where it falls thirty feet in a half mile over black shales on edge. Along the upper half of this course, the limestones are almost continuously exposed along the river-banks, rising in sharp ridges on both sides from 100 to 800 feet high. Along the lower half, the hills retreat and leave a wide sandy valley, covered with black and white spruce with a few larch and white birch. The largest trees rarely exceed twelve inches in diameter and are much shorter than those seen about the Cambrian Lake.

Pyrites Chute

Below the chute, the course is north-west for fifteen miles. For four miles the channel averages three-quarters of a mile in width, and the surrounding country is low and flat, with sharp hills of rusty rock and a few exposures of limestone on the east side. A number of low islands of limestone occur in the next mile, at the end of which the river, at the Limestone Falls, descends sixty feet over ledges of that rock, which cross the river-valley obliquely, and form a dam over which the water pours in three main channels. The middle channel follows the strike of the rock and forms a chute, while the other two fall vertically, directly across the strike. Below the falls, for four miles, the river, about a half mile wide, flows between scarped banks of sand and gravel seventy-five feet high; and then, narrowing to less than 200 yards, for five miles it rushes through a narrow valley called Manitou Gorge, cut out of limestone and shales, with walls from 50 to 300 feet high. Heavy rapids are met with throughout the gorge, and considerable danger was encountered running these with half loaded canoes, especially at the lower end, where outcrops of limestone cross the valley, hemming the water into narrow channels and causing small chutes. Below the gorge, the river for six miles gradually bends towards the east until it is joined by the Natwakami, Larch or Still-water River, a large branch from the west. Along this portion the current is strong, and a number of large islands of sand and shingle

Limestone Falls.

Manitou Gorge.

divide the river into several channels. The banks are cut out of clay, overlain by sand, and often over one hundred feet high. As the forks are approached, the banks on the west side become lower, and form a broad sandy plain between the two rivers. The Stillwater River has about half the volume of the main stream, and flows in from the westward, through a wide valley. There must be a considerable quantity of clay along its banks, as its water is quite muddy, in marked contrast to the clear water of the main stream.

Stillwater River.

Route to Hudson Bay.

By this branch the Indians journey to Hudson Bay. They follow it to its head, and cross from there to Clearwater Lake, and by the discharge of this lake reach Richmond Gulf. The Rev. Mr. Peck, a missionary of the Church Mission Society, crossed by this route in 1885, and the first expedition of the Hudson's Bay Company to Ungava, traversed the same route from Hudson Bay in 1824.

Character of river and country below the Stillwater.

Immediately below the Stillwater, the river turns to the north-east, and for five miles is less than a half mile wide, flowing with a swift current between low, terraced banks in a valley two or three miles wide, bounded by sharp hills from 500 to 600 feet high. These hills, still composed of Cambrian rocks, run in sharp ridges from a quarter of a mile to two miles apart. The direction of the ridges is roughly at right-angles to that of the river. They resemble one another very closely, and sixteen of them were noted in as many miles. They have a cliff face towards the south-west, and a gentle slope towards the north-east, apparently coinciding with the dip of the rocks. All the cliffs show a thick capping of hard rock, probably trap, with rusty weathering shales beneath. On the steep side, the hard capping rock often projects beyond the softer shales, and so forms overhanging cliffs. The lower valley, where unburnt, is wooded with small black and white spruce and larch, growing in open glades upon the terrace. These trees also grow on the hillsides, up to about 200 feet above the river. Above this, only mosses and arctic shrubs are seen about the watercourses, the remainder being naked rock, which forms over one half of the area under consideration. Ten miles below the Stillwater, a small river comes in from the westward. The valley, five miles below the forks, widens to five or six miles, and the river spreads out to over a mile, becomes very shallow, and is greatly obstructed by sand and shingle shoals, as it flows along with a strong current, in the same direction for twenty-one miles.

Trees.

Toward the lower end of this reach, the sharp Cambrian hills give place to others of Laurentian rock, whose outline is less rugged and more rounded. The interval between the river and the rocky hills is occupied by a terraced sandy plain from twenty to fifty feet above the river and is partly covered with small trees.

Low ledges of gneiss now cross the stream and form a number of small rocky islands, causing a heavy rapid for nearly a mile, followed, two miles below, by another a quarter of a mile long. At both rapids, the water is shallow, and the channel is obstructed by reefs and large boulders. The foot of the second rapid marks the head of tide-water. Head of tide-water.

From here the course changes to east-north-east for eighteen miles. The hills on both sides retreat still farther, and appear to be considerably lower. The river is now from two to five miles wide, and is broken into numerous channels by long low islands of sand, and shoals bare at low water. The river banks are from ten to twenty feet high, with a wide drift plain extending to the foot of the bare, rocky hills, on which the remnants of terraces are seen up to 300 feet above the present water-level. This plain is only partly wooded with small black and white spruce, and but two clumps of small balsam poplar were seen on the north bank. Turning again to the north-east, the river becomes still wider, with a deep bay on the north side, around which the rocky hills sweep; these then cross the river seven miles down the course, where they form a number of high rocky islands, that hem the water into deep channels, through which it rushes rapidly in and out according to the state of the tide. At and below the islands, the river varies from a mile to a mile and a half in width, and its valley is bounded by rounded rocky hills, rising from 100 to 300 feet directly from the water, with only in a few places a narrow border of drift between, which is sometimes terraced one hundred feet above the present sea-level. The course continues nearly north-east to the mouth of the river, some twenty miles below.

Fort Chimo, the Hudson's Bay Company's establishment, is situated facing a small cove on a low terrace on the south shore, about two miles below the islands. The terrace is about 200 yards wide, and is backed by low rounded hills of gneiss. Small black spruce trees grow only in protected hollows about the post, and the general aspect is very uninviting, with barren, rocky hills bounding the horizon on every side. The post consists of about a dozen buildings, including a dwelling house for the officer in charge, four or five for the servants, a trading shop, office, two provision stores, oil shed, salt shed, carpenter, cooper and blacksmith shops and a dwelling house for the Indians. These buildings are all, or nearly all, made of imported lumber. There are a number of small boats attached to the post, along with a small sloop and a steam launch, used in connection with the salmon fishery. At present a vessel of about twenty tons is being built there, Fort Chimo.

from wood obtained about Ungava Bay ; most of it coming from some distance up the Whale River, which is the next large stream flowing into the bay to the eastward. Firewood for the post is cut during the winter in the vicinity of the first rapid, and is rafted down the river in summer.

The post is supplied by the company's steamer "Eric," which arrives at Fort Chimo about the first week in September, and remains there, loading and unloading, for about two weeks. This is the only communication with the outside world, and when the ship leaves, all touch with civilization is lost until the following year.

Fur trade.

The fur trade is, of course, the most important, and is carried on both with the Indians and Eskimo. Foxes are the most numerous of the fur-bearing animals, and are found throughout the barren and wooded country ; they occur as to numbers in the following order : white, red, cross, black and blue. Martens come next, and are chiefly taken by the Indians along the edge of the wooded country, about the head-waters of the rivers. Their fur is very thick, dark and long, and the skins are generally larger than those caught farther south. Wolverines are common along the edge of the barrens and northward. White bears are killed frequently along the coast. Black bears are very rare, and specimens of the barren-ground brown bear are obtained only at infrequent intervals. Mink and otter are not common, and the beaver is not found north of the thickly wooded area. Formerly a great number of dressed caribou skins were traded at Ungava ; but during the last two years very few were brought in, owing to a change in the routes of migration of that animal.

Salmon fishery.

The salmon fishery is carried on at a number of places along the river, below the post, during the month of August, and the annual catch averages one hundred tierces for export. Salmon are also taken in the mouths of the Whale and George rivers, the average catch at the former place being fifty tierces, and at the latter one hundred and twenty tierces. Formerly the company employed a small refrigerator steamer in this trade at Ungava, and the frozen salmon were taken to London for sale. This has been abandoned for several years, and the salmon are now split and salted. The white porpoise is also taken at Ungava, on the Leaf River, a stream a short distance north of the mouth of the Koksoak, and at George River. The total amount of oil so obtained is about eighty tierces of forty gallons each. Other articles purchased are feathers, ivory and eider down.

Seven years ago there were ninety families of Indians trading at Fort Chimo. But in the famine, due to the failure of the caribou hunt, during the winter of 1892-93, nineteen families starved to death in a body, and at another place six families were totally lost; besides these, all the other Indians were throughout the winter in a state of chronic starvation, and many died, so that out of a population of two hundred and fifty persons, less than one hundred and fifty survive. Indians.

Hamilton Inlet.

Hamilton Inlet, Invuktoke, or Esquimaux Bay is the largest and most important of the many long, narrow fiords or inlets that indent the Atlantic coast of Labrador and Newfoundland. Its greatest length, from Indian Harbour to the mouth of the Hamilton River at its head, is slightly over one hundred and fifty miles, while its average breadth is about fourteen miles. The longest axis lies north-east and south-west. At its mouth, from the mainland near Purple Island, on the north shore, to Grinder Point, on the south side, the distance is twenty-three miles. Thence the inlet gradually narrows for forty-three miles to the mouth of the Double Mer, where the width is less than two miles. Here the inlet is divided by a long rocky ridge, the northern portion, or the Double Mer, extending westward some forty miles. A narrow, less than one mile wide, extends from the point five miles into the main, or Groswater Bay. Again widening, the channel is divided by a large rocky island five miles long called Henrietta Island. At its head, on the south side, a long narrow bay, called Back Bay or Backway, runs off to the eastward for about twenty-five miles, with an average breadth of four miles. At the east end of this bay a ridge one hundred and fifty feet high separates it from a small lake, with a sluggish brook that empties into a bay on the coast. The total distance between the head of the bay and the sea coast is not over ten miles; the country between appears to be wholly formed of drift material, and it is quite probable that in pre-glacial time there was an opening of the coast here. Hamilton Inlet. Double Mer. Backway.

The main bay above Henrietta Island quickly expands to four miles, and then more gradually to twelve miles, at the mouth of Valley Bight, eighteen miles above the narrows. Valley Bight is a small bay on the north side, about three miles wide at its mouth, and gradually narrowing for five miles to its head. From the mouth of this bay the main body has an average breadth of eight miles as far as Charley Point, some eight miles up. This portion is greatly obstructed by islands, of which Neveisik, St. John and Haines islands are of large size, and are also high and rocky. From Charley Point Valley Bight.

to Mulligan Point the distance is thirty miles, and the average breadth of this portion is fifteen miles, with two large bays, one on each side. That on the north side is called Nebavick or Mulligan

Mulligan Bay.

Bay, and extends behind the long, low point of the same name. It is about four miles wide at its mouth, and of about the same depth, with a small river coming in at its head. The bay on the south side is called Etagaulett or Big Bay; it is ten miles wide and nearly five miles deep.

From Mulligan Point to the mouth of the Northwest River, some twenty-three miles, the breadth gradually decreases to eight miles, and considerable intervals of low sandy land intervene between the water and highlands behind, while the waters on both sides are shallow, and are greatly obstructed by sandy shoals and low islands, especially on the north side, where a fringe of islands extends several miles out from Mulligan Point to within four miles of the mouth of the river.

Northwest River.

The Northwest River flows in at the foot of a small shallow bay, and at its mouth is about 100 yards wide, with an average depth of fifteen feet. The narrows are only half a mile long, and then the river expands into a shallow lake, one mile wide and three miles long, at the head of which is another contraction of about 400 yards, with a strong current where the river flows out of Grand Lake. This is a large body of fresh-water extending westward some forty miles, and is from two to five miles wide, and very deep. As only a comparatively narrow strip of low sandy land separates this lake from the bay, and the sand has probably been deposited there by aqueous or glacial agencies, it is probable that at no very remote time the lake formed an extension of the present inlet.

On the south side, immediately opposite the mouth of the Northwest River, is Carter Basin. This is about three miles long and a mile and a half wide, and is connected with the main body by a channel little over one mile long. Into this basin two rivers empty, the larger

Kenamou River.

or western one is called the Kenamou River. It is a large stream that rises on the highlands to the south-west, where its sources interlock with those of the St. Augustine and Natashquan rivers, which empty southward into the Gulf of St. Lawrence. The Indians report that it flows through a deep valley in the Mealy Mountains and is unnavigable with canoes, owing to the almost continuous, steep, shallow rapids. No high falls are reported on this stream. The smaller stream is called the Kenemich River, and takes its rise on the top of the Mealy Mountains only a short distance inland, to the south and south-east of its mouth. It descends the steep sides of the hills close to its mouth in a succession of high and beautiful waterfalls.

From the mouth of the Northwest River, the shore trends southward nine miles to the end of Sandy Point, a low, broad expanse of sand stretching this distance out from the north side, evidently the remains of drift brought down by the Hamilton River. Opposite Sandy Point the bay is only three miles and a half wide, and shoal water, caused by an extension of the point, continues to the south side, with only eighteen feet of water at the deepest part, where the channel is less than a half-mile wide. Sandy Point.

Beyond the point, the shore again trends northward, forming Goose Bay, which averages nine miles in width and is nearly twenty miles long, to the head of Terrington Basin, where Goose Bay River flows in. This is a shallow stream, draining a considerable area of country between the Grand and Northwest rivers. Goose Bay is in most places quite shallow, being filled up with sand brought down by the Grand or Hamilton River, which flows in on the south side, nine miles above Sandy Point. A low sandy point, about five miles wide, separates the river from the upper part of Goose Bay. Goose Bay.

The country surrounding Hamilton Inlet is generally high and rocky. On the north side, commencing at the entrance to the bay, the hills range from 100 to 400 feet, and are only partly wooded with small black spruce, in the valleys and on the protected sides. As the narrows are approached, the land rises from 200 to 500 feet, and continues between these heights, until Valleys Bight is passed. Beyond, it is still higher, seldom under 500 and often over 800 feet, forming a high rocky ridge separating Double Mer from the main bay. Fifteen miles above Charley Point, the hills pass inland around the head of Mulligan Bay, leaving a wide interval of low land between their bases and the shore. Character of surrounding country.

Still continuing inland, the hills cross from the head of Mulligan Bay to the shores of Grand Lake, and are more irregular in height and outline than below. One hill called Mokami, or Kokkak, rises in an imposing cone of over 1000 feet, with bare rocky sides and top, forming a conspicuous landmark, said to be visible from any high hill, within a radius of seventy-five miles. The hills above Northwest River skirt the north side of Goose Bay, and gradually close in beyond it, to form, with those of the south shore, the wide valley of the Hamilton River. Mokami Hill.

The country along the south side of Hamilton Inlet at its entrance, is comparatively low and swampy. The hills first reach the shore about fifteen miles below the narrows, and then follow it closely to the mouth of Backway. Along the narrows they rise abruptly from 500 to 1000 feet, and in places are flanked with sandy terraces up to 150 feet above the sea. Along Backway they average 600 feet, and culminate in a rounded conical peak called Monat, over 1000 feet high.

Monat.

On the other side of Backway there is generally an interval of low land, rising in terraces to the foot-hills of a high, barren range called the Mealy Mountains, that occupies a large area of country between the south side of Hamilton Inlet and the head of Sandwich Bay. These mountains rise precipitously from 800 to 1200 feet along the side of the inlet, without any low land, from the mouth of Backway to within ten miles of the mouth of Carter Basin, where they pass inland, and ultimately form the south wall of the Hamilton River valley. Along the inlet the sides and tops of these hills are almost totally devoid of trees, owing to the blasts of the prevailing cold north-west wind that sweep across the bay, especially during the winter season. Inland, it is reported that small trees grow abundantly in protected valleys. As the head of the inlet is approached, the trees are seen to cover the lower slopes and to rise higher and higher, until near the mouth of the Hamilton River, they are found extending to the very tops of the hills, here from 600 to 800 feet high.

Mealy Mountains.

George Island.

Below the narrows, the inlet is obstructed by a number of large rocky islands; of these the most conspicuous is George Island, which lies about six miles off the south shore, at the entrance. It is nearly four miles long and in its highest point 750 feet above sea-level. A number of smaller islands are clustered along the shore, on the north side at the entrance, and Indian Harbour, an important cod fishing station, is situated among these. From the entrance the inlet is practically free of islands to within half way to the narrows, where it becomes obstructed by several large ones scattered up its middle. The islands above the narrows have been referred to previously as extending as far as Charley Point.

Depth of water.

Below the narrows, the greatest depth laid down on the chart is fifty fathoms, and the average depth is about thirty fathoms. The channel at the narrows and on the north side of Henrietta Island, ranges from ten to twenty fathoms in depth. Above, the water rapidly deepens, and soon shows ninety-two fathoms; it continues very deep to beyond Mulligan Bay, where it begin to shoal, especially along the shore, a fact probably due to the filling up of the bottom with material brought down by the large rivers emptying into the head of the bay. Twenty fathoms appear to be the average depth of the deeper parts to nearly opposite Northwest River, then it rapidly shoals to fifteen and to five fathoms, until the bar at Sandy Point is crossed, after which slightly deeper water is found, which again shoals gradually to three fathoms at the mouth of the Hamilton River.

At Indian Harbour the tide rises seven feet at springs; at the lower end of the narrows the rise is four feet, while above the narrows the rise is only about two feet and continues the same to the head of the inlet, where the rise and fall of the tide is much modified by the direction and strength of the wind. Below the narrows, there is a strong current formed by the ebb and flow of the tide; while through the narrows the rising and falling water rushes with a velocity varying from four to seven miles an hour, and in a number of places heavy rapids occur, which, with whirlpools and eddies, render the passage of small boats dangerous when the current is at its strongest. Above the narrows, there is no perceptible current, except that caused by winds. The shores of the outer part of the inlet are partly wooded with small black spruce and larch, while the hills and islands support only a growth of low arctic shrubs and willows. As the narrows are approached, the trees become larger and on the protected north side cover the hills to their tops. White spruce, balsam fir and small white birch are seen. Continuing up the bay, the trees become larger and better until on the low lands about its head, plenty of trees of the above species grow to sizes that fit them for commercial purposes, and aspen and balsam poplar are abundant. At Northwest River, and also at the mouths of the Kenamou and Hamilton rivers, good crops of potatoes and other garden vegetables are grown annually, and it is said that oats will readily ripen also. At and below the narrows, the cold arctic current, which passes down the coast, so lowers the general summer temperature, that potatoes cannot be profitably grown, and garden crops are confined to turnips, radishes and lettuce.

Rise of tide.

Trees.

Crops.

Hamilton Inlet is the present southern limit of the Eskimo on the Atlantic coast. There is now a little tribe of some half dozen families living in log houses on the shore of a cove called Carawalla at the head of Henrietta Island. A few more families are scattered along the shores of the lower half of the inlet. They are in a state of semi-civilization, having adopted European dress, and all talk more or less English. They are poor and dependent on the fishery and seal hunt for a livelihood. The Hudson's Bay Company have two establishments on Hamilton Inlet; the larger, called Rigolet, is situated on the north shore at the narrows, about three miles above the entrance to Double Mer. This is the head-quarters of the Labrador Coast, or Esquimaux Bay district, the officer in charge having under his care the posts of Cartwright on Sandwich Bay, of Northwest River at the mouth of that stream, as well as those of Davis Inlet, and of Nachvak, both situated on the coast to the northward.

Eskimo.

Hudson's Bay Company posts.

Trade.

The post at Rigolet consists of about a dozen houses and stores, and trade for fur and fish is carried on with the Eskimo and "planters." The trade of the post at Northwest River is made with the "planters" living about the upper part of the inlet, and with the Indians, who hunt in the country drained by the Hamilton and Northwest rivers, as well as with those hunting to the southward in the Mealy Mountains. A Roman Catholic chapel was erected some years ago near this post, and a missionary priest from the St. Lawrence used annually to visit the Indians there, during the summer. These visits, it is understood, are no longer to be made, the Indians being advised to go instead to Mingan, or other posts on the St. Lawrence, to meet the missionaries. All the Indians of the region profess Christianity, and are very careful to keep all the observances of the church, even when far inland, but their beliefs seem to be inextricably mixed up with their older pagan ideas, and often their views on subjects of religion are very curious.

Missionaries.

Indians.

The Indians frequenting Northwest River post are probably the most miserable and ill-conditioned in Labrador. Being deer hunters, and consequently depending largely on the caribou, both for food and clothing, they have little inclination to trap fur-bearing animals and thus improve their condition by trade. As their wants are mainly confined to tea, tobacco, powder and shot, and some few articles of clothing, a small amount of hunting only is necessary to provide their price, and beyond this, except for the labour of following the deer, or fishing, they do nothing, spending much of their time lounging about their tents. They will not work, even when offered very high pay, and when asked so to do, simply laugh and say they are not hungry. They are so improvident that they never lay in a stock of fish in the autumn, as the Indians to the westward do, and when during the winter, from some cause or other, they fail to find the caribou, they are soon reduced to starvation, and many die.

These Indians belong in part to both the Montagnais and Nascaupee tribes. The former tribe hunts between Hamilton Inlet and the Gulf of St. Lawrence, the latter to the west and north-west of Hamilton Inlet. No great physical difference can be observed between these tribes; if there is any, the Nascaupees appear to be slightly taller and less robustly built than the Montagnais. They talk different dialects of the Cree language, but the difference is so slight, that they converse freely together, and understand one another quite readily. The name Nascaupee in the Montagnais dialect signifies "the ignorant ones" and is given on account of their lack of knowledge in regard to the works and ways of civilization, owing to their want of communication with the outside world.

Hamilton River.

The Hamilton River is the most important stream of the eastern watershed of the Labrador Peninsula. Its drainage-basin embraces a wide area of the country extending from the head of Hamilton Inlet westward to longitude 68°, or nearly half way across the peninsula. To the northward its tributaries interlock with those of the Northwest River which also flows into Hamilton Inlet, and with the headwaters of the George River and branches of the Koksoak River that empty into Ungava Bay. The southern limit of its large tributaries is very irregular, and may be roughly taken to be near the fifty-second parallel of latitude, where the watershed separating them from streams flowing southward into the St. Lawrence, is extremely sinuous and almost impossible to trace or define. Drainage-basin of Hamilton River.

Westward of the Hamilton basin, the general slope of the country is northward, and the drainage is in that direction from about latitude 52°, the water reaching the ocean by the Koksoak River, which drains a considerable area of the central interior between the head of the Hamilton River and the Big River flowing into Hudson Bay.

Owing to the great difference in physical character between its upper and lower portions, the Hamilton River is naturally divided into two parts at the Grand Falls some 250 miles above its mouth. The lower part occupies a distinct valley, cut out of Archæan rocks, with the present river-level from 500 to 800 feet below the general level of the surrounding country. The valley varies in width from 100 yards to more than two miles, and the river flows down it, between banks of drift, with a strong current broken by rapids in several places, especially along the upper stretches, but only in one place does it fall over an obstruction of rock. Division of river into upper and lower.

This valley is well wooded where unburnt, and the timber is all of fair size and of commercial value, in marked contrast to the small stunted trees found partly covering the rolling country of the table-land, on either side of the valley. The river flows into the head of Hamilton Inlet, on the south side, and a long point of drift material, principally sand, projects out into the bay, separating the river from the head of Goose Bay, which extends several miles west of the mouth of the river on its north side. This point is evidently formed from material transported from the valley above and deposited in the quiet waters at the head of the inlet. The river-valley.

From the mouth of the river to the first fall, the distance is twenty-seven miles, and the direction is S. 80° W. At its mouth, the river is three-quarters of a mile wide, and shortly above widens out to nearly a mile and a half, for ten miles; then a number of flat, sandy shoals bare at low stages of the water, divide it into numerous channels. Man-of-war Island lies on the north side five miles up stream; it is low and about a mile long, and has a few trees growing on it.

On the south side, a mile and a half above the mouth, a channel enters from Mud Lake, a shallow body of water two miles long, extending to the foot of the mountains and separated from the river by two low, wooded islands. About two miles above Man-of-war Island, on the south side, a small stream, called Traverspine River flows in; it rises in the mountains to the southward. Where this stream discharges into the river, there is a small Indian trading establishment, and the proprietor, Jos. Michelin, has made a little clearing about the place, where he grows an abundant crop of potatoes.

Traverspine River.

Three miles and a half above Traverspine, another small stream, called Caroline Brook, comes in from the south. Opposite its entrance, the river narrows to a mile, and its channel continues with this width twelve miles to Muskrat Island, which is low and well-wooded, and a mile and a half long. On the south shore, opposite this island, there is a little clearing with the winter habitation of Thomas Hope, the last permanent residence on the river. For three miles above Muskrat Island, the river narrows to less than a third of a mile, with a narrow island obstructing the channel in the upper mile. Above this narrow, the channel widens out into a nearly circular basin about two miles across, into the west side of which the river pours with a chute of twenty feet called Muskrat Fall. Above this chute is a heavy rapid 400 yards long, with a chute of twenty-five feet at its head, the total fall being seventy feet. At the chutes, where it rushes over ledges of gneiss, the river is only about 100 yards wide. Immediately on the north side of the falls, there is a rounded, rocky hill rising 250 feet above the level of the valley. On the north side of this hill is a wide plain of fine till. Where the edge of the plain has been cut away to form the basin below the chute, a wide section of over 100 feet of fine till is exposed, without any sign of rock in place. The present channel at the falls is of recent origin, and it is probable that previous to the glacial period, the river-channel was filled up with drift material, so that when the river again resumed its course, it was diverted from its old channel by the obstruction, and passed to the south of the hill where the drift deposit was less thick. Having once cut to the rock surface, well below the upper level of the drift on the opposite side, it has continued in its present channel ever since.

Muskrat Island.

Muskrat Fall.

At its mouth, the banks of the river are low and sandy, and have scarped faces from ten to thirty feet high, increasing slowly in height as the river is ascended. Terraces are seen to the south, flanking the mountains up to 300 feet above sea-level. Above Traverspine the banks rise from sixty to one hundred feet and are cut out of coarse, yellowish, stratified sands. Character of river-valley below Musk-rat Fall.

The western extension of the Mealy Mountains forms the southern wall of the valley, and, above the head of the low point separating the river from Goose Bay, rocky hills are seen also on the north side. The valley, as far as the first fall, varies in width from two to five miles, and the river passes close to the foot of the rocky hills on the south side fifteen miles above its outlet. As the valley has been partly filled with drift, out of which the present channel is cut, it is only when the river accidentally passes close to the rocky walls of the valley, that any rock-exposures are seen. The hills on both sides rise from 400 to 600 feet above the river-level, and partly represent the general height of the surrounding plateau, which rises somewhat higher back from the valley on both sides. These hills are wooded to their summits, but as the upper level is approached, the trees become small and stunted, and only a very few species grow on the table-land above. Black spruce forms over ninety per cent of the wood, the remainder being made up of larch, white birch and balsam fir.

Timber. In the valley, on the contrary, the growth of timber is very good, considering the position. White spruce trees two feet in diameter and more than seventy feet high are not uncommon, and a large number of ship spars have been taken out about Traverspine. The black spruce does not grow quite as large as the white, but is still large enough to afford good commercial timber, and the same may be said of the larch growing in the valley. Balsam fir, white birch and both aspen and balsam poplar are here met with and grow to fifteen inches in diameter.

Above the chutes the river soon widens out, and for thirty-five miles flows from the south-west. Its average width for this distance is slightly less than a mile. Fourteen miles above the chutes it narrows to less than a quarter of a mile, and is broken by rapids for two miles above. Below these rapids there is a great sandy shoal, which extends across the course of the river and has forced it to cut a deep bay on the south side out of white sand, that rises in almost perpendicular banks over one hundred feet above the water. This place is called Sandy Banks, and the Hudson's Bay Company formerly maintained a small trading-post on the north side, where the site of their clearing is marked by a new growth of birch. Sandy Banks.

Above Sandy Banks, the stream is again over a mile wide, with a large island dividing it into two channels, and a deep bay runs off to the north-west from the main channel. Above this island the average breadth is half a mile for five miles, when it again widens to a mile for three miles, to the foot of the Porcupine Rapids. These rapids are nearly three miles long, with a deep channel, the river being about 300 yards wide. There is good tracking along the banks, and no portage is necessary to pass this obstruction.

Gull-island Lake.

Above the Porcupine Rapids, the river expands again into Gull-island Lake, which is six miles long, and not over a mile wide. The name is a misnomer, as there is a very perceptible current throughout. Gull Island is a small rocky islet on the south side, about two miles from the head of the lake. From the Muskrat Falls to Gull Island the character of the river and valley is very similar to the portion below. The river-channel is wide and shallow, at ordinary stages of the water, and the current is strong, so that tracking is resorted to in ascending with boats. The hills, as far as Gull Island, remain about four miles apart, and there begin to approach, so that the valley is less than half a mile wide at the head of Gull-island Lake. The height of the hills varies from 500 to 800 feet above the level of the river, and much of their surface is burnt over, with less than half of the north side of the valley wooded, with trees similar to those described along the lower stretch.

Terraces.

There are considerable accumulations of drift in the valley, into which the river has cut its present channel. Terraces are common and well marked, especially about the mouths of small streams flowing down from the table-land, on both sides. As many as seven were seen on the south side, below the Porcupine Rapids, the highest being 200 feet up the flank of the mountains. The river-banks are sandy and steep, and vary from twenty to seventy feet, with a margin of nearly level shore at the water's edge, which affords good ground for tracking. Only two exposures of rock were seen along this course. Several small streams fall into the main river on both sides, but none of them is of any size or importance.

Valley above Gull-island Lake.

From the head of Gull-island Lake, the course of the valley changes more to the northward and the river flows from N. 70° E. for eight miles; the next course is from S. 60° W. for two miles, and is followed by a stretch of nine miles directly from the south. Along all these three courses, the valley is from a quarter to half a mile wide, with almost perpendicular rocky walls that rise abruptly from the water more than 800 feet, with narrow intervals of drift only in a few places. The river varies from 100 to 400 yards in width, and throughout the distance is an almost continuous rapid. Up the stream the Gull Rapid is the first, and extends from the lake upwards for five miles. The water is shallow, and the channel is full of rocky reefs and large boulders, over which it tumbles in foaming masses. Owing to the shallow water, this portion of the river blocks in winter with ice, which is piled up in all directions in great disorder and is quite impassable with loaded sleighs, until after sufficient snow has fallen to cover up and smooth out the smaller inequalities. The second rapid is at the bend and is called the Horse-shoe Rapid; it is also shallow and full of huge boulders. Along the upper stretch, the river only in one place exceeds 100 yards in width, where it passes a small island. The channel is rocky and the water is deep, so that, although the current is very strong, the water is not broken, except by a dead swell, until within a mile of the head of the stretch where a heavy rapid makes it necessary to portage.

Horse-shoe Rapid.

At the head of this rapid, a large branch called Minipi River, enters the main stream from the south, through a deep, narrow valley, down which it rushes with heavy rapids. This stream discharges a large volume of water from its gathering ground on the table-land to the south and south-west of its mouth. It is said to rise in chains of lakes close to the head-waters of the Natashquan and St. Augustine rivers which flow into the Gulf of St. Lawrence.

Minipi River

Between Gull-island Lake and the Minipi River three-fourths of the timber in the valleys and on the hills of both sides has been burned, much of it by a great fire that raged throughout the summer of 1893. In the green woods remaining, many large spruce trees were seen, from twenty to twenty-four inches in diameter, and sufficiently long to furnish three logs each. A few narrow terraces were seen on the hillsides, but owing to the scanty drift deposits there is not much chance for the development of terraces.

Above the Minipi, the main stream bends sharply, and for twenty-five miles flows from N. 80° W. The valley gradually widens out and to the upper end of the course varies from one to two miles across. Its walls continue to rise from 700 to 900 feet above the water, and are nearly everywhere burnt bare. Terraces again become well marked and numerous, and range from 20 to 250 feet in height. The river channel is cut out of the drift, and the banks rise from ten to one hundred feet above the stream. The river, for five miles above the forks, is never more than 300 yards wide, and then widens to about a quarter of a mile, and is broken by a small shallow rapid where it passes four well-wooded islands, three miles up. Beyond the islands, it narrows again for four miles, and from there to the end of the course

River-valley above the Minipi.

it passes what is known as the "slack water," where the width varies from 400 to 600 yards in a deep channel with gentle current. There are three large islands along the upper three miles, with another called Cockatoo Island four miles below. Two large brooks come in from the north near the middle of the course; the lower one issues from a deep cut in the hills. On the south side a small river flows in at the upper end above the islands. Both sides of the valley is almost wholly burnt to within a few miles of the upper end, where the north side is well wooded with somewhat smaller trees than those previously met with.

The valley now bends to the north-west for five miles, and then northward for ten miles to where a small river flows in from the north-east. Along these courses it does not anywhere exceed one mile from side to side, and the hills are particularly high and rugged on the west side, where they rise from 800 to 1000 feet almost perpendicularly from the water. They are well wooded on both sides to within a short distance of the small river, where the eastern limit of an immense area of burnt country crosses the valley. This area, which extends on both sides of the valley almost to Grand Falls, has been traversed by numerous fires during different years, so that, with the exception of isolated patches here and there, all the original forest has been destroyed, and the sides of the valley and adjoining table-land are either destitute of trees, or partly covered with small second-growth timber of no commercial value.

Great area of burnt land.

Along the first or north-west course, the channel is only about 300 yards wide, and is obstructed by a number of small islands of drift. The current is strong, and there is a small river that drops into the valley with a beautiful fall on the west side near the head of the course. Above, the channel widens to a quarter of a mile, and the river is shallow, with small rapids to the upper end of the north course. The stream that here flows in from the north-east, called Câche River, is the largest yet seen on this side, and it has a distinct valley cut down between the rocky hills to a level with that of the main stream. Terraces are not prominently marked along the portion of the river just described.

Câche River.

For the next twelve miles the valley is narrow and very crooked, with sharp bends and a general course north-westward. The rocky walls rise sharply on both sides almost directly from the water, leaving in most places only a narrow margin of steep shore. The hills are nearly all bare and rocky. Terraces are not common, and are best developed at the junction of a small branch from the west about eight miles up, where the terraces are seen rising one above another for 250 feet.

The river varies from 100 to 300 yards across, and is deep and so rapid that in winter ice is formed only along the shores. The Mouni Rapids are two miles long and have three heavy pitches at the upper end. Mouni Rapids.

The valley above straightens, and the river flows S. 80° E. from Lake Winokapau six miles above. The stream continues narrow and rapid to the outlet of the lake, and is joined by a small stream five miles below it. Towards the lake the sides of the valley continue to increase in height, until at its outlet bare rocky precipices tower above it 1000 feet or more, with great masses of broken rock piled up at their base. Only a few small trees grow in cracks on the sides and tops, and the general aspect is wild and grand.

Beyond the valley on both sides, the country is covered with broken chains of rounded hills of gneiss that rise from 200 to 500 feet above the general level of the table-land, which is itself over 700 feet above the surface of the lake. The lower lands are either swampy or covered by small irregular lakes that discharge by streams into the valley, where they often fall perpendicularly 500 feet down the rocky walls. During the winter these streams freeze up, and their positions are marked by masses of ice often attached in fantastic forms to the bare surface of the rocks. In other places where the slope is less, the water wells out from below the already formed ice and congeals on its surface, in this manner forming large ice cones.

The table-land is almost denuded by fire, only small patches of trees being left about the lakes and swamps. These consist of a thick growth of stunted black spruce and larch of no commercial value.

Lake Winokapau fills an expansion of the river-valley, and is thirty-four miles long, its general course being N. 80° W., with two slight bends near its middle. For fifteen miles from its outlet it does not exceed a mile in width. Beyond, to its head, the breadth varies from one and a half to two miles. Lake Winokapau.

From its outlet, the north shore, for six miles, has a narrow margin of drift between the water and the rocky hills. Beyond this, and all along the south side, the rocky walls of the valley rise abruptly from the lake, and there is a marked absence of drift both on the hillsides and in the valley.

The water is remarkably deep; an isolated sounding taken fifteen miles up the lake, and about midway across, gave 427 feet, while another taken by Mr. Bryant* gave 407 feet. A third sounding was Great depth of the lake.

*A journey to the Grand Falls of Labrador, p. 26.

made fifty feet from shore on the south side, opposite the first mentioned, and gave a depth of 80 feet. No other soundings were made, owing to the difficulty experienced in cutting through the ice, which at the time we passed was four feet nine inches thick, and two hours were required to make a hole through it with the implements at hand. Information obtained from Indians shows that the lower three-quarters of the lake are exceedingly deep; the upper quarter has been filled in with drift brought down by the river.

The present bottom of the lake probably nearly represents the level of the river previous to the glacial period, the valley below having been in places filled with drift during that time to levels indicated by the terraces seen along the sides of the valley, rising in places from 200 to 250 feet above the present river-bed. The absence of any rocky ledges in the river-bottom, except at the first falls, where the ancient channel is on the north side of the rocky hill, points to this conclusion. Why the valley should be filled with drift below and above Lake Winokapau, and the portion occupied by the lake should be almost free of it, is a problem in glacial geology to be worked out in the future, but for which there are at present no data.

A small island of drift, covered with willows and a few large white spruce trees, six miles from the head of the lake, marks the beginning of the shallow portion. Above the island there are numerous wide, sandy shoals, bare at low stages of the water, and separated from one another by narrow channels. The main channel passes close to the south bank, and two large, low, wooded islands of drift separates it from a smaller shallow channel on the north side. At the head of the lake, a small branch called the Elizabeth River flows in from the west, down a narrow valley, while the main valley bends to the north-west.

Elizabeth River.

Ancient Hudson's Bay post.

On the south side, at the mouth of the Elizabeth River, there is a wide, sandy plain about twenty-five feet above the river, and on it the Hudson's Bay Company formerly had a post, which was abandoned in 1873, and subsequently destroyed by fire. A small river flows into the lake from the south opposite the lowest island, and the drift on the hillsides is terraced up to 200 feet about its mouth. On the north side, there are three large brooks with deeply cut valleys, and one on the south side; besides these, there are many small streams that fall directly over the precipices, from the table-land above, breaking the monotony of the rocky walls, and adding greatly to the beauty of the scenery.

Character of surrounding country.

The hills that bound the valley on its south side are remarkably regular in outline and have been rounded and scratched by glacier ice.

Those on the north side often rise in perpendicular cliffs from the lake; their faces and tops are angular and rugged, and do not appear to have been glaciated. The walls on both sides are from 700 to 1000 feet high, gradually lowering towards the head of the lake, where the slopes are less abrupt and the hills more rounded. At the head of the lake, the general level of the table-land on the south side is 950 feet above it. The country on top is nearly level, and covered with small lakes. Ten or fifteen miles to the south, a conical hill rises about 500 feet above the table-land. On the north side after an abrupt rise of 400 or 500 feet, the land slopes gradually, and does not attain the elevation of the south side for several miles back from the valley. Only a few small scattered clumps of trees remain of the original forest in the lake-valley; these show that at one time the shores and sloping hillsides were thickly covered with large trees of white and black spruce, up to thirty inches in diameter. At present most of the hills are bare, or covered only with small second-growth spruce and birch. The table-land to the southward is quite bare of trees, only the blackened stumps of the former forest remaining. On the north side, bare patches alternate with scattered second-growth black spruce of small size.

Lake Winokapau is well stocked with fish, the employees of the Hudson's Bay Company when stationed there, depended to a large extent on fish for food. In the old journals* of the post, the catches of the nets are recorded, and show that fish were taken abundantly, especially in the spring. The catch included carp, whitefish, lake and river trout in the order named. Potatoes and turnips were grown at the post, but not very successfully, as after planting in the spring, everybody left the place, and did not return until September, leaving the crops to grow without cultivation. Fish.

From the mouth of the Elizabeth River, the main valley turns N. 40° W., and continues in that direction five miles to the mouth of the Metchin River, a small stream having a deep valley, and used as a canoe route to the north-west interior by the Indians. Along this course the valley is about a mile wide, with the hills more rounded and sloping than below, owing to the great quantities of drift deposited here, through which only the rocky summits protrude. The river is less than half a mile wide, and flows close to the north side to within half a mile of the Metchin, where the deposits brought down by that stream have formed a low plain, and have forced the main stream into a narrow channel close to the south wall. Terraces are common and rise to more than 200 feet above the river. Metchin River.

*Winokapau journals seen at Rigolet.

The course of the valley now changes to N. 70° W., and with a few minor bends, continues in that direction for forty-five miles to the foot of the Bodwoin Cañon below the Grand Falls.

The narrow channel continues for a half mile above the mouth of the Metchin River, where it widens out to an average width of 500 yards, with high rocky walls on the south side, and drift-covered slopes on the north side. Six miles further up, there is a sharp bend to the northward for one mile, when the river again resumes its previous course. At this bend, the walls on both sides exceed 800 feet, and those on the west side rise in perpendicular cliffs directly from the river, which is here 400 yards wide. Above the bend, the character of the valley is unchanged for twelve miles, the valley being from half a mile to a mile wide, with high rugged hills, mostly burnt, on both sides. The channel is cut out of the drift, and is more irregular in width than below, being frequently narrowed by projecting points. The current is swift and the water appears to be deep. Seven miles up, a small branch flows in from the northward, in a gorge cut down to the level of the main valley.

Character of the valley.

After two well-wooded sandy islands are passed, another sharp bend of a mile to the northward, opens out into a wider valley entirely filled by the river, where there is little drift on the hillsides or along shore. The river is very shallow and the current swift. This stretch is seven miles long, and at its head the channel narrows to less than 200 yards, owing to the amount of material brought down by the Portage River, which cuts through a cliff and descends into the valley by a fall of nearly 200 feet, that is almost hidden by the huge blocks of rock heaped up at its bottom. Shortly above the Portage River, the main stream again widens out, filling the valley from wall to wall, and varying from half a mile to one mile in width for eight miles. The portage-route of the Grand Falls, leaves the valley on the north side four miles above the mouth of the Portage River.

Portage River.

Opposite this place and above it, the river is silted up with sand brought down by rapids and deposited in the wider, quieter waters. This sand forms wide flats, covered at high stages of the river, and cut by numerous, deep, winding channels. Four miles above the portage, two large, low, densely wooded islands mark the foot of the rapids that extend almost continuously beyond for twelve miles, to the mouth of the cañon. The channel above the islands soon narrows, and the drift deposits thin out, finally almost wholly disappearing from the sides of the valley, which contracts to less than 300 yards in width and becomes crooked. Three miles above the upper island, the first rocky ledge since leaving the Muskrat Fall, is seen in the river bottom. Here, there is a heavy rapid which continues half a mile to a short bend to the westward. At the foot of the rapid, Messrs. Cole and Cary, of the Bodwoin College Expedition, had the misfortune to burn their boat and supplies, and on this account it has been called Disaster Rapid. The charred remains of the boat was found close to the shore in a small patch of burnt woods.

Disaster Rapid.

Two miles above this rapid, at the angle of a small sharp bend, a large branch flows in from the west in a well defined valley. Inquiries made among the Indians who had hunted about here, failed to yield any information concerning this stream, and they were surprised to hear of its existence, as they all were without knowledge of any large stream between the main river and the Elizabeth River, which enters Lake Winokapau. The only explanation given about this unknown stream, was that it must be a deep channel of the Valley River, and must leave that stream some distance above the main forks; but the origin and existence of two deep, well defined valleys such as these, forming an island, is anomalous, and could only be accounted for by the river splitting into two branches before it leaves the table-land.

Unknown channels.

Above the junction of this stream, two sharp bends of the narrow main valley lead, after three miles, to a long straight stretch, where the valley widens somewhat, and patches of terraced drift are seen high up its rocky walls. At the upper end of the last bend, a small stream comes in from the n rth, descending in a succession of beautiful cascades from the table-land 700 feet above. This stream drains a number of lakes, and when the river is swollen by the spring freshets, a small portion of it passes up a narrow bay above the Grand Falls, and from there by a rocky channel into the small lakes, of which the discharge is thus much increased during the early spring.

For five miles above the junction of this stream, the valley continues straight and narrow, with sandy terraces flanking the rocky walls at intervals along both sides. The river varies from fifty to one hundred yards in width, and rushes along in a continuous heavy rapid, from where the main body of water enters the valley by Bodwoin Cañon.

Above the mouth of this cañon the main valley continues in the same direction upwards of ten miles, and then bends slightly northward, its further extension being concealed by the high walls on the north side. As far as seen from the cañon, the valley appears to be from a quarter to half a mile wide, and is partly filled with terraced drift, with a branch flowing with a moderate current down it. This branch has less than a quarter of the volume of the other river, and rises in Lake

Main valley above Bodwoin Cañon.

Ossokmanuan on the table-land, thirty miles to the westward. This lake also discharges by another outlet into the main Hamilton River, described later. Eight miles in a straight line north-north-west of the mouth of the cañon, the main branch of the Hamilton River issues from a small lake-expansion, almost on a level with the surrounding surface of the table-land, and begins one of the greatest and wildest descents of any river in eastern America. A large number of barometric readings taken in the vicinity, in conjunction with regular readings at the Hudson's Bay Company's post, at Northwest River, give the height of the river as it issues from the lake as 1660 feet above sea-level. The height of the valley at the mouth of the gorge, determined in the same manner, is very close to 900 feet above sea-level. Consequently, in twelve miles, the total fall is 760 feet. Such a fall would be nothing extraordinary for a small stream, in a mountainous country, but is phenomenal in a great river like the Hamilton, which has been estimated to discharge at this point about 50,000 cubic feet per second, or nearly the mean volume of the Ottawa River, at Ottawa, that stream having a mean volume of 85,000 cubic feet per second at Grenville,* where it includes the waters of the Rideau, Gatineau and Lièvre rivers. The descent includes a sheer fall of 302 feet, the rest being in the form of heavy rapids.

Descent of the river near the Grand Falls.

Volume of water at Grand Falls.

The outlet of the lake is dotted over with small rocky islands, capped with dense thickets of small evergreens. These islands extend downward for a mile and divide the river into a number of narrow channels with a swift current. The stream, flowing southward, then narrows to less than 400 yards, and in the next mile passes over a number of rocky ledges between low wooded banks, falling fifty feet in a continuous heavy rapid. Again it widens out to nearly a mile, and for two miles is obstructed by many small islands, flowing swiftly between them, with short broken rapids. Next, turning south-east, it contracts to less than half its previous width, and rushes along with heavy rapids, in a shallow channel full of huge boulders, with low rocky shores, capped with thin deposit of coarse gravel and sand, and wooded above with small spruce and larch. In this manner the river continues for three miles, gradually narrowing as it descends, with a fall of forty-five feet along the last two courses. The banks and bottom of the river are wholly formed of rock, and as the stream in the next mile has cut a narrow and gradually deepening trough out of the solid rock, at the lower end of the course it flows in a narrow gorge, with sloping rocky walls 110 feet below the level of its upper end. As it descends

*General Report Public Works, Canada, 1867-1882, p. 840.

its width decreases from 150 to 50 yards, and it hurries along with tremendous rapids.

The last 300 yards are down a very steep grade, where the confined waters rush in a swirling mass, thrown into enormous, long surging waves, at least twenty feet from crest to hollow, the deafening noise of which completely drowns the heavy boom of the great falls immeiately below. After a final great wave, the pent up mass of water is shot down a very steep incline of rock for 100 feet, where it breaks into a mass of foam, and plunges into a circular basin below, the momentum acquired during the first part of the fall being sufficient to carry it well out from the perpendicular wall of rock at the bottom, leaving almost a free passage between the foot of the cliff and the falling water. The total fall from the crest of the incline to the basin below is 302 feet. The Indians believe that the space between the falling water and the rocky wall is occupied by the spirits of two maidens who were accidentally carried over the falls, and who now pass their time in dressing and preparing deer skins. On this account, or more probably because of the feelings of awe inspired by the grandeur of the surroundings and the enormous power displayed in this rush of waters, those who hunt in the vicinity cannot be induced to visit the falls or the cañon below. Grand Falls.

The shape and character of this fall resembles closely, though on a gigantic scale that of a small stream flowing down a V-shaped trough, inclined at a high angle, and issuing freely from its lower end. The basin into which the river precipitates itself, is nearly circular and about 200 yards in diameter. It is surrounded on all sides by nearly perpendicular rocky walls 500 feet high, except at the narrow cut at the head of the falls, and where the river issues from the basin. The surface of the basin is violently agitated by the rush of water from above, and its huge lumpy waves break high up the rocky walls. The falls are best seen from the top of the south wall, directly opposite, but the dense columns of vapour that rise out of the basin often interfere with the view, and give a blurred, fogged appearance to photographs taken from that side. The noise of the fall has a stunning effect, and, although deadened because of its inclosed situation, can be heard for more than ten miles away, as a deep, booming sound. The cloud of mist is also visible from any eminence within a radius of twenty miles. Character of the falls.

The river leaves the basin by a narrow cañon at right-angles to the falls. It flows eastward about a third of a mile, and then bends sharply to the south-west for a half mile, next to the east for a like distance, followed by another south-west bend of similar length. Bodwoin Cañon.

In this manner it zigzags until it finally ends in the main valley of the river.

From the falls to the mouth of the cañon the distance in a straight line is not above four miles, but by the river it is over twice as far. This cañon is cut down into solid gneiss, granite and gabbro. Its zigzag course conforms with the direction of two sets of fracture, or cleavage-planes in the rocks, which appear to have caused lines of weakness and aided the eroding action of the water. Except on the inner sides of the bend, where there is a sloping wall of boulders, the walls are nearly perpendicular. At the top, the width rarely exceeds one hundred yards; while at the bottom the river is seldom over one hundred feet wide, and often measures less than half that width. The fall of the river from the basin to the mouth of the cañon is 260 feet, and, as this is accomplished without any heavy drops, the magnitude and grandeur of the rush of water at the bottom of the gorge may be imagined.

The cañon is cut sharply into the surface of the table-land without any appreciable dip of the ground towards it, and there is so little indication of its presence from above, that the gorge is seen only within a few yards of its edge; and its walls are so steep, and the bushes along the top so thick, that in most places it is necessary to hold on to an overhanging tree and lean far out in order to see the narrow white line of broken foaming water that rushes along 500 feet below. As the country slopes gently towards the main valley, the cañon does not deepen with the descent of the river in it, and the walls are everywhere from 500 to 600 feet high, varying with the undulating surface of the table-land.

Origin of Bodwoin Cañon.

There is little doubt that the cañon is a valley of erosion in an unfinished state of formation, and probably previous to the glacial period was the valley of a much smaller stream than the one at present flowing through it. At that time the main stream in all likelihood followed the main valley. There is no evidence that the valley has been cut back, or otherwise eroded since the close of the glacial period, beyond the removal of the drift, which then filled it nearly to the top, as patches of drift still remain on the inner sides of the sharp bends. From the above facts some idea can be had of the great length of time required for the erosion of the main valley of the river, from the falls to the mouth of Hamilton Inlet, which is really a submerged portion of this river-valley.

John McLean.

John McLean, of the Hudson's Bay Company, as before stated, was the first white man to see the fall. In 1839, while on a journey overland from Ungava Bay to Hamilton Inlet, he descended the Hamilton River, visiting the fall in passing, and he has given a short description of it in his book.* The falls are known to the Indians and inhabitants of the Labrador coast as the Grand Falls, but as a recognition of the discoverer, as well as the indefinite character of the above name, it is now proposed to call them the Grand or McLean Falls.

The cañon below the falls was first discovered and partly traced by Messrs. Cary and Cole in the summer of 1891, and was named by them Bodwoin Cañon. Messrs. Bryant and Kenason also visited the fall in 1891, arriving there a few days later than the first party. Among others of the Hudson's Bay Company officers who have seen the fall, may be mentioned a Mr. McPherson, who visited them shortly after their discovery by McLean, Père Babel, O.M.I., a missionary who spent two or three seasons living with the Indians about the head-waters of the Hamilton River about 1870, has also given the writer a most graphic account of his visit to the fall at that time.

Portage-route past the Grand Falls.

The portage-route past the fall and rapids, leaves the main valley on the north side at the foot of the rapids fifteen miles below the mouth of the cañon. The road rises 700 feet in a quarter of a mile as it ascends the steep wall of the valley by a narrow cut beside a small stream. It then passes over undulating wooded country, rising slowly for two miles, to a small lake that lies north-west of the lower end of the portage. Crossing the eastern end of the lake, the route turns northward and passes over four portages of 1000, 200, 200, 300 yards long respectively, that connect as many small lakes or ponds. The last portage ends near the middle of Island Lake, which is about three miles long and a mile wide, with its longest axis running almost east-and-west. This lake discharges from its east end into another large lake that empties into the Portage River. Crossing to the north side of Island Lake, two short portages, with a small swampy lake between, lead into another lake about two miles and a half long, which also discharges into the Portage River. The route now changes to west-north-west, and continues in that direction until it reaches the lake-expansion of the river above the falls. From the western end of the last lake a mile portage through a swamp leads to a narrow lake one mile long, with another mile portage from its west end into a similar narrow lake. The next portage is slightly shorter, and crosses a small watershed, passing close to the foot of a high hill on the south side called Lookout Mountain; it ends in a long narrow bay at the east end of Lookout Lake, the largest body of water along the route. This lake is followed seven miles, to its western end, where a small river enters. The

Lookout Mountain.

*Twenty-five years in the Hudson's Bay Territory. Vol. II., p. 75.

greatest breadth near the east end is less than two miles. The lake is shallow and dotted with small rocky islands. It discharges by the little river that falls into the main valley five miles below the cañon, and which, as already mentioned, forms a discharge of the main river during periods of high water.

The inlet is followed through a number of lake-expansions for five miles, with three short portages past rapids and a final one of a half mile that leads to the head of a deep bay of the main river.

Country about Lookout Mountain.

Lookout Mountain is a long round hill of gabbro, that rises 460 feet above Lookout Lake. Its summit and sides have been burnt over, and from its top a good view of the surrounding country may be obtained. The surface of the table-land is broken by long rocky hills, connected by low ridges of drift, that run west-north-west, or parallel to the direction of the glacial striæ. Between the ridges there are wide valleys filled by long irregular lakes or swamps. Southward from the top of Lookout Mountain, the country is seen sloping towards the river-valley, and it is much more broken and rugged than in other directions. One sharp rugged hill rises well above the rest, and is probably the Mount Hyde of the Bodwoin Expedition.

The position of the river-valley here is well marked, the country sloping towards it on both sides. Beyond the valley, the country appears to be somewhat higher than on the north side. Ranges of burnt hills are seen stretching away to the south-west, and bounding the horizon in that direction. Westward, the position of the Grand Falls is marked by the column of mist that rises high over it. No other feature marks the presence of the cañon, and gently undulating hills extend as far as can be seen. To the north-west, the country is very similar, and in the distance lake-expansions of the river appear. North and north-eastward, the ridges of hills are seen running in regular lines with a higher range bounding the sky-line about twenty miles away. Where any depression occurs in the ridges, a shining patch of water marks the position of a lake, in the valleys beyond. Looking south-east, or parallel to the ridges, a perfect network of small island-dotted lakes are seen, filling each valley, and separated from one another only by low ridges of drift. In the distance are a number of high rounded hills near the discharge of the Portage River.

Trees.

Over half of the surrounding country has been stripped bare by frequent fires. In the swamps and around the shores of the lakes, where the trees are unburnt, black spruce and larch of small size grow thickly together. On the sides of the hills these trees are more stunted, and are separated by open glades. Where the hillsides have been burnt years ago, they are covered with a tangled mass of willows and alders, while the tops are coated with white moss and semi-arctic shrubs and berries. Only on the banks of the river about the falls were trees large enough for commercial purposes seen. Surrounding the basin, white spruce seventy feet high and two feet in diameter at the base, are common, along with large-sized black spruce, balsam fir and white birch. The moisture from the constant column of spray, as well as the warmth from the open water, may account for the better growth of the trees in the neighbourhood. Along the river banks and on the islands above the falls, the trees are larger, and more varied than about the lakes of the portage-route, fair-sized white and black spruce, balsam fir, larch and white birch growing freely.

Upper Hamilton River.

Character of the upper Hamilton River.

Above the Grand Falls, the character of the river changes completely ; it no longer flows in a distinct valley cut deep into the surrounding country, but nearly on a level with the surface of the table-land, spreading out so as to fill the valleys between the long, low ridges of hills that are arranged in echelon all over the country. The river in passing around the ridges is often broken into several channels by large islands formed by separate ridges, and in other places, where there are wide valleys between the hills, it fills long, shallow lakes, with deep bays, and often studded with islands. The river is now so divided into channels and so diversified with island-covered lakes, that without a guide it is almost impossible to follow its main channel, and much time is lost tracing its course through the lakes, which often have several channels discharging into, as well as out of them. The current instead of flowing regularly, now alternates between short rapids and long lake stretches.

The banks are often low, and covered with a dense growth of small willows and alders, that form a wide fringe between the water and the conifers of the higher ground behind. In other places, generally at rapids, the stream has cut a channel into the sandy drift that forms the low ridges on one or both sides. The shores of the lakes are very often low, with an interval of flat land between the water and the hills behind. These low shores and those of the islands are generally thickly strewn with boulders, piled up in ridges by the expansion and drift of the ice in the spring. The general direction of the river from the Grand Falls to Lake Petitsikapau, more than 100 miles above, is nearly west-north-west, or parallel to the direction of the glacial striæ, and that of the ridges of drift. All these features give to the upper portion of the river an aspect of newness, and indicate that its present course and conditions have been determined by the post-glacial configuration of the table-land, in marked contrast to the ancient appearance of the deep, rock-walled valley of erosion below the cañon in which the river must have flowed for ages, slowly abrading the hard gneisses and granites and carrying away the results of atmospheric decay brought down from its sides by the rains and small tributary streams.

Post-glacial channels.

Jacopie Lake.

The first expansion of the river above the portage is called Jacopie Lake. It is seven miles long and about two wide, with two deep bays on the east side, and is surrounded by low, rounded, rocky hills, totally burnt over on the east side, and partly so on the west. A chain of low islands of drift extends along the east side, and almost closes off the bays from the main body of the lake. In a few places, bosses of rock are seen rising from beneath the drift of the islands. At the head of the lake, the current is quite strong in the main channel, with a heavy rapid at the inlet, in order to avoid which, when the water is high, a small channel behind a long narrow island is followed by canoes. There are two short portages here past small chutes.

Above the lake, is a stretch of eight miles where the river flows swiftly and is broken by two heavy shallow rapids filled with large boulders. The banks are generally low, and are cut out of drift, the channel averaging half a mile across. Numerous islands divide the stream into different channels, especially towards the upper end, where the river broadens out into the next lake-expansion. This is called Flour Lake, and it is ten miles long and apparently about two miles wide, with deep bays running off on both sides. Its surface is so broken by islands, many of them small and rocky, that it is impossible to determine the shore-line of the lake by passing up its middle. There is distinct evidence of current everywhere, and this grows stronger as the head of the expansion is approached. At the upper end the river splits into two nearly equal channels, that do not again join until Sandgirt Lake is reached, fifteen miles above. The north channel is very rapid, and soon leads into Lobstick Lake, a large and long body of water on the route to Lake Michikamau, described in the part of the report referring to that lake. From Lobstick Lake, a stretch of five miles of river leads into Sandgirt Lake, where the streams again unite.

Flour Lake.

Channel from Lobstick Lake.

The south channel, leading out of Flour Lake, is the ordinary canoe route. The distance by this channel between Flour and Sandgirt lakes is fifteen miles. The stream varies from 100 yards to over a mile in width, and is obstructed by numerous islands. The surrounding country is low and rolling, with long ridges of drift and little rock. The trees are small and are principally black spruce and larch, with white spruce and balsam fir along shore, and white birch on the hill-sides. The current is always strong, and it is broken by seven short heavy rapids, where the stream narrows and is obstructed by islands. The river-bed at these rapids is composed of large, rounded boulders.

Five miles above Flour Lake, the south channel again divides, and the canoe route continues to follow the southern branch, which flows out of a deep bay in the south-east corner of Sandgirt Lake, the other channel flowing out of the next bay a few miles to the northward.

Sandgirt Lake.

Lake Kanikauwinikau or Sandgirt Lake, is an irregular-shaped, shallow body of water, with many islands of drift and with sandy or boulder-strewn shores. It is twelve miles long from the southern outlet to the mouth of the Ashuanipi Branch, on its north-west side, where two deep bays continue on several miles farther to the westward, one on each side of the river, and divided from it by wide low points of drift. From the mouth of the Attikonak Branch, on the south-west side, to the northern outlet, the distance is eight miles. Besides the two bays on the west side already mentioned, there are two others, one to the south and the other to the north; these are only a few miles deep, with small streams flowing in at their heads from wide-spreading series of lakes. The country surrounding the lake is somewhat higher than that along the river below, especially on its south side, where a ridge of rocky hills extends from the east to the shores of the Attikonak Branch. Some twenty miles westward, a wide range of hills is seen rising with barren sides over 800 feet above the general level, and it continues in a north-western direction. The outlines of these hills are sharp and rugged, quite unlike those of the hills of the Archæan area already passed through. Only their lower slopes are wooded, and in the month of August large masses of ice and snow remained in protected gullies on their northern slopes. The name of Ice Mountains was given to these hills. To the north-west, rounded hills from 200 to 500 feet high are seen, separated by wide valleys containing the bays on that side of the lake. To the north and north-east, the country is undulating and lower, with higher, rounded ridges bounding the horizon. To the east, only low ridges of drift break the general level.

Gathering place of Indians.

Sandgirt Lake is an important gathering place for the Indians of the interior, on account of the number of routes that centre here. The Hamilton River divides into two branches, the larger or Ashuanipi Branch flowing in from the north-west and the Attikonak Branch from the south. The main route from the Hamilton River to Lake Michikamau also ends here. The Indians who trade on the lower St. Lawrence and hunt anywhere in this vicinity, always congregate here in the spring, and descend to the coast in company, either by the Romaine or Moisie River.

Returning in the autumn, they travel together to this lake, where they separate into small parties for their winter hunts. The standing poles of their wigwams, scattered everywhere along the shores and on the islands of the lake, show that several families camp here.

On account of its favourable situation, a câche was made on an island in the lake, to store the surplus provisions and outfit, and from here, with lightened canoes, the Ashuanipi Branch was first explored, after which a trip was made to and around Lake Michikamau, before Sandgirt Lake was finally left by the Attikonak Branch.

Ashuanipi Branch.

Ashuanipi River.

The Ashuanipi Branch, as before stated, flows into the lake on its west side. Its course for thirty miles above, to Birch Lake, is nearly north-west. For five miles above Sandgirt Lake, the river flows through a flat, well-wooded country, and then passes close along the southern base of a sharp, rocky hill 300 feet high. This has been burnt over, giving an unobstructed view from its summit. The bay of the lake to the northward comes close to the base of the hill, and extends some miles westward of it, where the continuation of the valley is filled with a large treeless swamp. South-west of the river, a network of large lakes occupies over half of the area between the river and the Ice Mountains, some ten miles distant. From this hill to a small lake-expansion four miles above, the river varies from 100 to 500 yards in width, with sandy banks from ten to sixty feet high, cut out of the roughly parallel ridges of indistinctly stratified drift, between which it flows with a swift current. The lake-expansion is about two miles wide and over three miles long; it is quite shallow, with low, willow-clad banks.

Ice Mountains.

A stretch of five miles of swift water, terminating above in a short rapid, separates the last from the next lake-expansion. A number of high islands of drift obstruct the channel, and the banks are again high and irregular. Occasional white spruce trees are met with along the river bottom, up to fifteen inches in diameter, along with small black spruce, larch, balsam fir, white birch, and a few clumps of small balsam poplar.

Increase in size of trees.

The next lake-expansion is eight miles long; its lower half is crowded with low islands, covered with willows; the shores are also low, with a wide fringe of willows and alders between the water and the trees behind. There is a long ridge on the north side, culminating in a rocky hill 300 feet high at its west end.

The increase in the size of the trees about this lake is very marked, and is probably due to the change in quality of the soil, caused by the disintegration of the Cambrian rocks, which here underlie the surface deposits and form a very large percentage of the drift.

White spruce thirty inches in diameter at the base and forty feet high is not uncommon along the shores, black spruce is often twenty-four inches in diameter at the base, but rapidly lessens above, so that few exceed eighteen inches six feet from the ground. Balsam fir is abundant, but not very large. White birch is also common, and grows up to ten or twelve inches in diameter, but is generally crooked and does not afford good bark for canoe-building. Small clumps of balsam poplar are met with frequently with trees six inches in diameter, but crooked and straggling like the birch.

At the head of the lake-expansion, an island seven miles long divides the river into two channels, with the greater part of river flowing in the northern one. The island is formed by a high ridge of drift into which the river has cut deeply in many places, giving sections of from twenty to sixty feet, and showing that the material is almost wholly sand, with evidence of bedding. In places the banks are cut into small terraces up to a height of sixty feet, in one place to the number of eight.

The north channel varies from 200 to 300 yards in width, is dotted with small islands of drift, and has a swift current with strong eddies behind sharp boulder-strewn points. All these eddies swarm with large brook trout from three to six pounds in weight. Five miles up, the channel widens out and is split by a number of large low islands as Birch Lake is entered.

Birch Lake.

The shape and size of this lake are well seen from the summit of a sharp rocky ridge that extends for two miles along its south side near its western end. This ridge is very similar to others that now run south-east and north-west, parallel to one another, with wide valleys between them. The hill consists of stratified Cambrian rocks, highly tilted, and has cliff-faces on both sides with intervals covered with drift resting on the steep slopes. The summit of the ridge is irregular and narrow, so that almost anywhere the foot of the hill can be seen on both sides from the top. The sides, where unburnt, are covered with large white spruce in open glades to within a hundred feet

Character of country about Birch Lake.

of the top, where they give place to a thick tangle of willows and alders. On the top the willows are smaller, less matted, and do not interfere greatly with travel. The higher points are only covered with small shrubs, including the cranberry *(Vaccinium Vitis-Idæa)* that grows in great profusion. The highest point of the ridge is about 350 feet above the water.

Birch Lake is ten miles long from the northern outlet to the mouth of its southern inlet, and is less than five miles across in its widest part. Long ridges of drift form deep bays at both ends. The large island already referred to divides the eastern end into two bays, while a long string of islands separates off another portion of the lake on the north. The western end is also deeply indented by three narrow bays that develope into channels of the river at their heads, and thus form two large islands that extend to the next lake to the north-west.

Cambrian ridges.

The north side of Birch Lake is bounded by a sharp ridge extending the whole length of that side. Its height varies from 300 to 400 feet; its top and the greater part of its south side are treeless, the lower parts having been burnt over many years ago, and the conifers have since given place to willows and alders. Fires have devastated much of the country surrounding the lake, and, as the trees once destroyed appear to grow again very slowly, large areas have a barren, desolate appearance; they are covered with small bushes and shrubs, and in many places only with white reindeer moss. This moss, or rather lichen, covers the ground everywhere, even in the thickest woods, and, except in wet weather, is much more agreeable under foot than the tangled masses of Kalmia and Labrador tea met with throughout the country to the southward. On the islands and shores where the forest is unburnt the trees are very similar in size to those last described. To the south of the ridge there is a wide valley stretching far away to the south and south-west, broken only by low ridges of drift and streaked everywhere with water—parts of large irregular lakes—the view from the ridge giving an impression that over one half of the surface in those directions is covered with water.

The southern inlet of Birch Lake appears to be the largest; it varies from 100 yards to nearly a mile in width, and is greatly obstructed by low, sandy islands, with shale beneath. The channels are shallow, and the current strong, with several small rapids, especially along the upper part, the last a heavy one 200 yards long, where the river flows out of Dyke Lake. There are twelve miles of river between the lakes, and several small streams enter by deep bays on both sides. At the foot of the upper rapid two channels separated by two long islands join as the river issues from Dyke Lake.

The shores along the river are low and well wooded, and the general flatness of the surrounding country is broken by a few short rocky ridges of irregular outline on both sides.

Dyke Lake

Entering Dyke Lake by the right-hand channel, a bay about one mile wide and four miles long is ascended to the end of the large island that extends from Birch Lake. The bay is walled in between steep rocky ridges that rise from 300 to 500 feet above the surface. The ridge on the north side terminates abruptly in a sharp pointed hill 490 feet high and cut transversely to the ridge by a great fault, and on this account called Fault Hill. The southern ridge is wooded, the northern one is mostly burnt. The lower flanks of Fault Hill are covered with groves of white and black spruce for 300 feet up; above this, only willows and alders grow to near the summit, where moss alone partly covers the surface. The trees, as the river is ascended, again become small, and, although large white spruce trees are met with on the lower flanks of the hills, they are stunted in height, and thick branches grow close to the ground, forming great knots in the trunk and rendering the wood practically valueless. Poplar is not seen above Birch Lake.

Country about Fault Hill.

The only way in which an idea of the extent and shape of these irregular lakes along the river can be obtained, is by climbing the hills. For this reason Fault Hill was ascended, and from its summit Dyke Lake was seen stretching away far to the north-west. The southern channel extends into a deep bay behind two large islands on the south side. These islands are separated by a narrow channel a short distance above Fault Hill, and from there the upper island continues five miles with a channel nearly half a mile wide, dividing it from a point of the mainland. Looking backwards, the two northern channels, as well as the one ascended, can be traced to Birch Lake. They are all dotted with islands, and the darker water in several places indicates short stretches of rapids.

The bay on the north side of Fault Hill, is much deeper and wider than that on the south side, and extends seven miles eastward. Its surface is covered with numerous islands, very irregular in shape, and apparently representing ridges of drift, the lower portions of which are submerged. Abreast of Fault Hill, the lake is nearly twelve miles wide, but no idea of its size can be obtained on its surface owing to the number of islands. Westward, the lake gradually narrows, and two large islands almost separate the northern side from the main body. Eight miles further up, the large islands terminate, and the lake narrows to about two miles.

The country about this lake is much rougher than any previously passed through and the north side of the lake is bounded by a continuous ridge that rises from 300 to 500 feet. The larger islands are high and rocky, and consists of broken ridges. Along the south shore, there is an interval of low land extending to within a short distance west of Fault Hill, where a wide ridge commences and extends westward several miles. This is probably one of the highest points in this region ; the main hill rises far above the surrounding ridges and the upper half appears quite barren.

Entrance to Lake Petitsikapau.

The lower land to the south is covered with large lakes, and the horizon is bounded by a long, unbroken ridge. From the narrows the lake continues north-west for nine miles to the head of the north bay, were a short, deep, rocky narrow about two hundred yards wide divides it from Lake Petitsikapau. A high rocky ridge bounds the north side of the lake along this part, with an interval of swamp between it and the water, terminating in a low muddy shore. The high land on the south side ends about three miles up, and is replaced by a flat swamp, thickly covered with black spruce and larch. The trees, on the slopes of the northern ridge are larger, and many stout, knotted white spruce are seen on the lower flanks more than two feet in diameter at three feet from the ground. The main river enters with a short rapid on the south side near the head of the lake. At the time this place was reached, the water in Lake Petitsikapau was very high, and a large volume was passing through the deep outlet, which was mistaken for the main river. In consequence, a week was spent carefully examining the western and northern shores of that lake, in search of a large river flowing into it.

Lake Petitsikapau.

Lake Petitsikapau (or Willow-fringed Lake) is the largest body of water in this part of the country. It fills a wide, shallow valley between sharp ridges of rocky hills similar to those already described. Minor ridges cut its ends into a number of deep bays and give to it a very irregular outline. Almost everywhere, the shores are low and swampy and bordered with willows. The greatest length is twenty-five miles from south-east to north-west, and its widest part measures eight miles across. The north-west end is divided into four narrow bays, of which the northern one is the longest. To the southward there are only two bays, the most southern of which is from two to three miles wide, and extends south-east over ten miles, with only a narrow neck of land between it and Dyke Lake. The northern end of the lake is covered with numerous low islands of limestone and shale ; these islands are generally long and narrow, running parallel to the strike of the rocks. The water between the islands is very shallow, and in many places difficulty is experienced in finding a passage for light canoes. The southern portion is comparatively free of islands, and those found there consist of drift and are somewhat higher than those of limestone and shale. The whole lake is very shallow, and in its widest part, where islands are absent, it was found not to exceed ten feet in depth. Small streams flow into the heads of all the northern bays, and from the ridges these are seen to drain chains of small lakes in a wide valley that extends many miles beyond the head of the lake, where the waters of Hamilton River interlock with those of a branch of the Koksoak River flowing into Ungava Bay. The largest stream entering the lake flows through a chain of lakes to the eastward and empties into the north-east bay. A rocky ridge from 200 to 300 feet high and less than a half mile wide, extends along the north shore westward of this stream, and divides Petitsikapau from a deep narrow bay of Lake Attikamagen or Deer-spear Lake, at the head of the George River, which also empties into Ungava Bay. This bay runs north-west some eight miles, and joins the main body of the lake, which, from the crest of the ridge, is seen stretching away several miles in that direction; it then bends eastward, where it disappears behind a high ridge. A deep cut in the horizon-line to the east shows where the outlet of the lake passes between the hills.

Shallow water.

Head-waters of Gorge River.

Lake Petitsikapau is on the edge of the barren grounds. The trees still grow in the valleys and on the lower hillsides, but the upper parts of the hills are barren. Northward a succession of high, barren ridges are seen, with an occasional glimpse of a lake, or of a valley wooded with small spruce and larch trees. Total barrens do not occur in Labrador until Ungava Bay is reached, as trees always grow in the river-valleys to the south of it, although the uplands beyond Petitsikapau are covered only with willows and arctic shrubbery.

For many years the Hudson's Bay Company had a post called Fort Nascaupee on the second northern bay of Petitsikapau. This post was established about the time of McLean's journeys from Ungava to Hamilton Inlet, in or about the year 1841, and it is mentioned by W. H. A. Davies in an article published in 1843, as having then been lately established.* This post was erected for trade with the Nascaupee Indians of the interior, and was quite successful until after the second establishment of Fort Chimo in 1866, when the Indians began to desert it; those from the north going to Fort Chimo, while the southern Indians traded at Mingan or Seven Islands, on the Gulf of St. Lawrence, or at Northwest River—all of them preferring to undertake the long

Fort Nascaupee.

*Trans. Lit. and Hist. Soc. Quebec, vol. IV., part I., p. 74.

arduous journey to and from the coast, where they could obtain better prices for their furs, and purchase provisions and other necessities at a much cheaper rate than at the interior post, where the cost of transport and maintenance added several hundred per cent to the original cost of the goods. The post was accordingly abandoned about 1873, and now the only trading posts of the interior are those situated at Nichicun and Mistassini.

Ruins of the fort.

The ruins of Fort Nascaupee stand in a small clearing, close to the shore of the lake, and only a short distance above high-water mark. The houses were built of small, squared logs, with board roofs. When visited, the dwelling-house was in a fair state of repair, with the window sashes and some of the glass still in place. The doors and movables inside had been broken up and used for firewood by Indians ; the roof was nearly unbroken, and leaked only in a few places. This building is about twelve by eighteen feet, and has a low room under the attic roof above. Adjoining the main building on each side are two smaller buildings, evidently used for a kitchen and store ; the roofs of both have fallen in. Traces about twenty yards to the east of these ruins, probably represent the remains of some outbuilding. About fifty yards behind, the powder-house covered with earth was seen, with broken roof and partly filled up with earth. Adjoining this is a small burying place with a large wooden cross in its centre, but without any marks on the graves, which are probably those of Indians. In the attic a fragment of "The Albion," of March 7th, 1846, was found. Close to the house were several patches of rhubarb eighteen inches high, while a number of introduced plants still flourish in the old door-yard.

River above Dyke Lake.

As previously stated, the main river flows into Dyke Lake, from the south, close to its north-west end. At its entrance the river is obstructed by a number of small rocky islands and large boulders, between which the stream descends in a heavy, shallow rapid about 300 yards long. The lake above the rapid has the general north-west and south-east trend, and is six miles long and two miles wide at its south end, gradually decreasing to a mile at the other end. Both sides are high and rocky. The river flows into the lake from the south almost opposite the outlet. At the entrance a large dyke crosses the stream, forming a number of islands with heavy rapids between them ; above the rapid is a short stretch of swift current, and a large island of drift divides it into two equal channels each about 300 yards wide, where the river falls with shallow rapids for a quarter of a mile from Astray Lake, immediately above.

Astray Lake, so called from our wanderings in search of the river, follows the general direction of all the lakes of the vicinity, determined by the course of the rocky ridges. From the head of its longest northern bay to where the river leaves it, the distance is twenty-five miles, and the south-eastern bay extends some distance beyond. In its widest part it is about four miles across. Two rocky ridges, forming long narrow points, divide the northern half into three deep narrow bays ; the southern end, five miles below the outlet, narrows to less than two miles, and passes close to the foot of Red Mountain, the high hill seen from the top of Fault Hill. Two low ridges of limestone extend down the centre of the wide part of the lake, and form chains of rocky islands. The ridges on the south side of the lake are low and broken, and the shore line on that side shows frequent low cliffs of yellowish-white limestone. Quartz Hill is a sharp hill of white quartzite that rises 300 feet above the lake, on the south side, opposite the outlet. This hill is wooded almost to its summit with white and black spruce trees, but on the summit they do not grow more than six inches high. The trees surrounding the lake are very similar to those seen about Dyke Lake, except that they are somewhat smaller. Astray Lake.

A small branch of the river flows into Astray Lake, twenty-four miles from its north end, coming in with a short, shallow rapid from the next lake, called Marble Lake, which is separated from the last only by a narrow ridge of limestone. The other channel of the river flows out of a south bay and joins Astray Lake, a few miles to the east of the first.

Marble Lake stretches north-westward from the outlet, and for four miles is more than three miles wide; it then contracts to about a mile, and becoming shallow, soon shows current, and thus changes into the river. There is a small rapid two miles above, where a ridge of drift-covered islands extends diagonally out from a long point on the north side causing the stream to flow in a narrow channel on the south side. The shores of the lake are low, and often composed of ledges of white limestone. The surrounding country is also low, apparently swampy, and well wooded with a thick growth of small spruce and larch. Marble Lake.

The river above the narrows continues to flow with a strong current from the north-west for six miles, in a shallow channel over half a mile wide, with low swampy shores. Many sandy shoals obstruct the channel, and huge boulders are scattered everywhere.

The course of the stream now changes to south-west, and in the next six miles is broken by heavy rapids, full of large boulders, as it descends from the next lake above. Flowing in this direction, it crosses the strike of the rock at a right-angle, and the rapids are formed by the river passing over nearly flat beds of limestone. Two miles above the bend, there is a fall of six feet, where the river drops down over the edge of a thick bed of limestone. The channel along this stretch is very irregular in width, and is often split by large islands. The rapids end in a long narrow lake trending north-north-west from its outlet for several miles to where it appears to end against a high range of hills. The west side of this lake is bounded by a continuous range of sharp, barren hills that extends far southward.

Menihek Lakes.

The river now nearly doubles on its former course, and passes directly from the south through three long narrow lakes, called the Menihek Lakes, connected by short river stretches .The lower lake is fifteen miles long from its outlet to its head, and it varies from one to two miles in breadth. The rocky ridge already referred to passes close along the west side, with foot-hills of drift in many places rising directly from the water. The country on the east side is low and swampy, and broken only by small ridges of drift. An invasion of sandy drift forms two long points extending out from the west side of the lake, contracting the channel and causing a wide shallow rapid nearly half a mile long, at the head of the lake. The next lake is twenty-three miles long and its average breadth is slightly greater than the last. The surrounding country is similar to that last described, being flat eastward and having the high, sharp range along the west side. Towards the upper end, the course of the lake and that of the hills diverge slightly, so that at its head the hills are from three to five miles distant, and are lower than to the northward. Twelve miles above the outlet of the lake, a large stream flows through a deep cut in the hills and enters the lake with heavy rapids from the west. Its volume is about equal to one-third of the whole river below.

Middle lake.

The middle lake is separated from the upper by a stretch of river three miles long. The stream is half a mile wide, and the channel is very shallow, with a moderate current. The banks on both sides are formed of drift, and those on the east side are terraced for sixty feet above the present level of the lakes. The upper lake is ten miles long and about two miles wide. It is very shallow and filled with islands of drift, two of which are high, with scarped banks of coarse sand. The range of hills on the west side is now from five to ten miles distant, and appears to be gradually dying away to the southward. In the distance, on the east side, a high range is seen, which is probably the Ice Mountains to the south-west of Sandgirt Lake.

The country on both sides of the lake is higher and more broken than previously noted, the ridges of drift being more pronounced.

This change in the topography is probably due to the change in the underlying rock, the stratified Cambrian beds giving place to Archæan schists.

Character of the country above the Menihek Lakes.

Above the upper lake the character of the river changes completely, and resemble the stretch between Sandgirt and Birch lakes, becoming narrow and rapid, with an irregular channel filled with many small islands of drift, and with irregular sandy banks cut out of ridges of till. Frequent short rapids, full of boulders, connect longer stretches of swift, unbroken water for the next twenty-four miles, to where the exploration ended at a small conical hill close to the east bank. From the summit of this hill looking southward up the valley, the river was seen to expand into a small lake a few miles above, and beyond that to again contract as it winds with short bends, from side to side. From information subsequently obtained from Indians acquainted with the part above, it was learned that it flows out of Ashuanipi Lake some thirty or forty miles south of the farthest point reached, and that its character remains the same to the outlet of that lake, with swifter water in a narrow, irregular channel, studded with many small islands. The region through which it passes is low and broken by rounded hills and ridges of drift that never rise more than 300 feet above the general level.

Ashuanipi Lake.

At the end of the survey the river is seventy-five yards wide with an average depth of six feet, and the current is about four miles an hour, giving a discharge of nearly 8000 cubic feet per second.

Lake Ashuanipi, from descriptions given by the Indians, is situated close to the watershed dividing the Hamilton River from the Moisie River. It is upwards of fifty miles long, very irregular in outline, with deep bays, and is partly covered with many islands, some of which are very large. It is not a deep lake, but its water is very clear and well stocked with fish.

Trees.

The trees along the river and the Menihek Lakes are much smaller than any previously seen. Black spruce forms ninety per cent of the whole, with larch next in abundance, and a few balsam and white birch. Along the lake shores the trees are very stunted, and all bent towards the south by the prevailing northerly winds. The stunted growth of this region is accounted for by the large areas of swamp land along both shores, where deep sphagnum covers the wet ground, which below a depth of eighteen inches from the surface is permanently frozen. The ridge on the west side of the river varies from 300 to 600 feet in height above the water, and is devoid of trees above the level of 200 feet. Much of the lower ground is also treeless, having been burnt over by extensive fires at different periods. After such fires the country is covered only by willows and alders for many years, until the spruce again reproduces itself.

Route to Lake Michikamau.

Having returned from the upper part of the Ashuanipi River to Sandgirt Lake, an exploration was next made from there to and around Lake Michikamau. A description of this portion of the country is introduced here, because the other route leads up the Attikonak Branch to its head, and from there down the Romaine River to the Gulf of St. Lawrence, and it is thought advisable to complete the description of the interior before entering upon that of the southern region.

Lobstick Lake.

The route to Michikamau leaves Sandgirt Lake by its northern discharge, which is four miles long, over half a mile wide, and is obstructed with large islands. The channels are shallow with low shores, and the current is strong, terminating in a quarter of a mile of heavy rapids, where the river empties into Lobstick Lake. This is another large body of water, divided into deep bays by long low points and large islands. The surrounding country is nearly flat, and broken only by small rounded hummocks of rock, that seldom rise over 100 feet above the general level. There is also a marked absence of the long parallel ridges of drift, and bare rock shows in almost every elevation, forming the many small islands scattered over the surface of the lakes. There are two deep bays that extend away from the inlet of the lake. One runs directly south-east, with its outlet close to Flour Lake, into which it discharges by the north channel of the river, as has been already mentioned. The other bay runs due east about eighteen miles, and is divided into two portions by two large islands, that extend from the westward of the inlet to within four miles of the head of this bay. There is also a great bay stretching in a north-west direction from the discharge and ending at the foot of a range of rounded hills some twenty-five miles distant, where a small river flows in, which is used by the Indians as a canoe-route to the caribou grounds on the George River, beyond the north end of Lake Michikamau.

The route to Michikamau follows the east bay, passing along the south shore of the large islands. Four miles from the inlet a narrow is passed, where the water between the low, rocky islands and shore is so shallow that only with difficulty a channel can be found for light canoes between the boulders, which thickly cover the bottom. At the narrow, a slight current is apparent flowing toward the west. Beyond the narrow, the route continues up the bay, passing between many rocky islands for ten miles, to another narrow about fifty yards wide, between the second large island and a long rocky point. Here, the current is strong for 200 yards, when the lake again opens out, but is covered with such a multitude of small rocky islands that no idea of its extent can be obtained by passing through it. For ten miles the route now follows the south shore, passing through narrow channels between the islets. A number of long, rocky points form deep, narrow bays along shore, and complicate the navigation, so that even an Indian guide is often at fault as to the right direction to follow. Two short heavy rapids on a small stream lead upwards into another island-covered lake, with even more crooked and narrower channels through which the route passes to a small bay near the eastern end of the lake, five miles from its outlet. Island-covered lakes.

A range of rounded hills from 200 to 400 feet high extends along the north and east sides of the lake. At the head of the small bay, there is a gap in the hills about half a mile wide, where at ordinary stages of the water a small stream trickles down from the next lake, a mile beyond, through a series of little rocky pools filled with boulders. When the water is high in Lake Michikamau, which connects with this small lake, a large stream discharges from it through this valley, thus connecting the headwaters of the Hamilton River with those of the Northwest River, which flows out of Lake Michikamau on its north side. A portage of a mile and a half is here ordinarily made. It crosses a rocky hill on the east side of the valley, and then passes over a high drift plain to near its upper end, where it terminates on the wide bouldery shore of the upper lake. This lake is very shallow and full of small rocky islands and points, with its shores and bottom deeply covered with boulders. It lies in a continuation of the valley, between low rocky hills. Two miles eastward, a rocky narrow occurs, where the water runs in and out, the direction of the flow being determined by that of the wind. Beyond the narrow, the lake widens to over two miles and extends a few degrees south of east, for eleven miles. A long low point separates this bay from a similar one on the north side. The south side is bounded by low, rounded, rocky hills, and the surface of the lake is strewn with small rocky islands, with shallow water between them, where large solitary boulders often rise above the surface. The bay on the north side of the long point, heads nearly opposite the portage, where a small stream enters it from the west. Near the mouth of this stream, the Hudson's Bay Company kept a small outpost called Michikamau during the Watershed between Hamilton and Northwest rivers. Hudson's Bay post.

time that Fort Nascaupee was occupied. Nothing can be learned about this outpost from the old Hudson's Bay Company journals at Rigolet or Northwest River, beyond the bare facts that a post was maintained there for a number of years, and was finally abandoned from the same reasons which caused Fort Nascaupee to be given up. This post was not visited, but, from the accounts of the Indians, some of the buildings have been accidentally burnt, and those remaining are in about the same state of decay as Fort Nascaupee.

From the head of the lake, the route turns south-east for nearly six miles, following down a small river that flows close along the west side of a rocky ridge flanked with sandy drift. The channel varies from 100 to 200 feet in width, and is bounded on the west side by a long point of sand, broken into narrow islands towards the south. This point and the islands are merely a ridge thrown up by the river, between it and a large lake to the westward.

The next change in direction is to due east, where the river flows first with a strong current between a number of low rocky islands, and then widening gradually passes, for four miles, between high banks of drift into Lake Michikamau. The hills, on the west side of the river are rounded and irregular, varying from 50 to 200 feet, and covered thickly with boulders. The east side is from 50 to 100 feet high and flat on the top, with traces of terraces from thirty to fifty feet above the present level of the lake.

Lake Michikamau.

Lake Michikamau.

Michikamau, or the Great Lake of the Indians, is the largest in eastern Labrador, being second only in size to Lake Mistassini. Its greatest length from south-east to north-west is about eighty miles, and it is twenty-five miles across in its widest part opposite the discharge. The main body of the lake is sixty miles long, with a long, narrow, unexplored bay extending south-east more than twenty miles, from the south-east corner. The widest part of the lake is in the southern third; in the northern part of the middle third, a long point, and a line of large, high islands of eruptive rock, extend far out from the north-east side, and narrow the lake to six miles. Between this point and the north-west end, the average breadth is eight miles. Islands are numerous along the shore and in the southern part of the

Finer scenery than about Mistassini.

lake but elsewhere it is unobstructed. In comparison with Lake Mistassini, this is a much finer body of water, and its size appears much greater, owing to the absence of long points, and chains of islands.

Photo. by A. P. Low, 1894.

VIEW OF SOUTH END OF LAKE MICHIKAMAU.
From Hill (450 ft.) near outlet of Lake.

Lake Michikamau is surrounded by rugged hills which add to the grandeur of the scenery, in marked contrast to the low monotonous shores of Mistassini. The water of the lake is remarkably clear and cold, and according to the Indians, who set lines through the ice in winter, the depth is very great.

Delays caused by wind.

On account of the heavy sea running during the whole time we were engaged in exploring the lake, it was impossible to make soundings from the small canoes, except behind islands and close to the shore. The lake being free from islands, any moderate wind raises such a sea that canoe travel is frequently impossible, and the Indians are often weeks in passing from the discharge to the north end, on their way to the caribou grounds.

The lake occupies a deep basin surrounded by chains of rounded Archæan hills that rise from 200 to 500 feet above its surface. This basin is very ancient, and like that of Lake Mistassini, must have existed previous to the deposition of the Cambrian rocks which are now found lying undisturbed in many places around the lake.

Character of the surrounding country.

The hills surrounding the lake are wooded for only about 200 feet above the water, their tops being covered with white lichens and small arctic shrubs. The outer islands and exposed points are also treeless, and the trees growing on the more protected islands and shores, are small black spruce and larch, with only an occasional clump of straggling white birch on the lower slopes of the hills. From a high barren hill north of the discharge, the view looking northward beyond the lake is exceedingly desolate, and shows a succession of low rocky ridges extending to the horizon. Trees grow only in small patches in the lake-strewn valleys between, and innumerable huge boulders are scattered indiscriminately everywhere. Northward along the west shore, for seven miles from the inlet; the shores are low and boulder-strewn, with many small low islands of drift strung along in a close fringe. The shore-line is irregular, and small ridges of drift form points behind which long, narrow bays run off westward. Some of the islands are flattened at the top, evidently by the action of water, and there are small terraces on the scarped sides up to thirty-five feet above the present level of the lake. Beyond this the shores become higher, with rounded hills of dark-brown rock rising in small hummocks above the drift, and also forming high rocky islands along shore. The country behind is quite rough, rising in irregular hills, from 50 to 250 feet high, and culminating in a sharp cone called Petiscapiskau, more than 350 feet high, which is visible for many miles along the other shore, and forms

Petiscapiskau Hill.

an admirable triangulation point. From Petiscapiskau to the north end of the lake, some six miles, the shores are low and sandy, with boulder-covered points. The land slopes gently up from the water to an even ridge of drift-covered granite about 300 feet high that extends north-west far beyond the north end of the lake.

The north shore is low and sandy, with shoal water extending far out from it. Many boulders of red granite are scattered about, both in and out of the water, and are sometimes arranged in rows along the shore, by the expansion of the ice in the spring before the waters rise.

Michikamats Lake.

A little river enters the north end of the lake, with a small rapid full of large boulders, where the channel is about fifty yards wide and too shallow for canoes. This is the discharge of Michikamats or Little Michikamau Lake, which occupies the northern extension of the valley and is separated from the main body of the lake only by a long, narrow interval of drift. This lake is over twenty-five miles long, and extends north-west to and beyond the north side of a high range of hills which is seen in the distance to divide the main valley. From the north end of Michikamats, three portages connecting narrow lakes lead to a branch of the George River, where the Indians of the region assemble in September to spear the caribou, which then cross the river in immense herds in the course of their annual migration from the high barren grounds behind Nain to the wooded region of the interior, where they pass the winter.

The east shore of Michikamau for twenty miles from the north end, is low, with bouldery points and reefs, and without the fringe of islands. A sharp rocky ridge 300 feet high runs parallel to the shore, and about six miles back from it. The interval between the water and the hills is occupied by small lakes and swamps that lie between low ridges of drift.

Twenty miles up, the highlands come out on the shore of the lake; and from there to the outlet, or for the next thirty miles, the shores are high and rocky, with deep water close in, and only a few small rocky islands along shore. The country behind is exceedingly broken and rough, with bare hills of dark-brown rock, rising in irregular, sharp bosses from 50 to 300 feet above the surface of the lake. Along the lake southward, the gabbro rocks, which form these broken hills, are replaced by granite near the discharge, and then the country becomes more regular, although still very hilly.

Country to the north of Michikamau.

From the summit of a barren granite hill 400 feet high, close by, the discharge or Northwest River is seen to leave the lake between a number of large, flat-topped islands of drift about thirty feet high, that extend outwards from the shore some four miles, and along it for six miles. A long, low point of drift, passing into a ridge, separates the river from the southern part of the lake, and the river is seen extending eastward through a succession of lake-expansions, until it passes behind and is hidden by rocky ridges in that direction. Another chain of lakes extends northward from the river and passes close to the base of a high range on the horizon. By these lakes a second route leads to the caribou grounds, which is used by the Indians when they want to proceed there direct, without the delay usually caused by adverse winds on Michikamau and Michikamats. The river flowing into the Atlantic near Davis Inlet, heads in the high range to the north, and a winter-route from the George River to the coast follows its course closely. Owing to many rapids and falls, entailing several long portages, this stream is never used as a canoe-route by the Indians.

From the discharge to the south-east end of the main body of the lake, some ten miles, the shores are low and sandy, with boulder-covered points and much swampy land behind. There is a deep narrow bay that extends south-east from this corner, where it passes away between rounded, rocky ridges, running parallel to its course. Its entrance is nearly closed by small, low islands; its upper end was not explored, but it is said to be more than twenty-five miles long, with a small river falling in at its head. Southern shores.

The south end of the lake is shallow and is dotted with many small islands of granite. The shore is very irregular and often rocky, and the country behind is broken by several ridges from 200 to 300 feet high. There is another deep bay on the south side, where a couple of small streams discharge.

The country along the west side is broken by low ridges, with a wide interval of swampy land along the shore. The coast-line is indented by deep bays, between wide swampy points, fringed with boulders. From the south end to within five miles of the inlet, there is a wide fringe of large islands of sandy drift, that rise only a few feet above the water.

Attikonak Branch.

The northern channel of the Attikonak Branch flows into Sandgirt Lake on its south side. It is ascended from the lake in an east-south-east direction three miles, to where it is broken by a heavy rapid nearly a mile long, with the channel about 100 yards wide, choked with Attikonak River.

large boulders. A portage of a quarter of a mile, across a boulder-strewn point, ends in a small bay of a lake-expansion above the rapid. From the head of the rapid the river widens to nearly a mile, and for the next three miles flows from south-south-east. Beyond this course the direction changes to north-west, and continues so for five miles, in a narrow, irregular channel, obstructed by numerous islands, and bounded by low, rocky shores in many places, to where a small branch from the base of the Ice Mountains joins the main stream. A chain of small lakes is now entered, connected by short rapids. The general course of the route through these lakes and a larger lake above them is south-south-east; the lower lakes are four miles long, while the large one, called Gabbro Lake, is seven miles from outlet to inlet, with a long bay stretching towards the south-east. Another narrow one mile long, with a slight current, joins Gabbro and Ossokmanuan lakes. The latter is a narrow body of water more than forty miles long, and lying nearly east-south-east. From its northern outlet it trends directly south for eight miles, and in this portion varies from two to four miles in width, being dotted by many small rocky islands, and surrounded by low rounded ridges of drift-covered rocky hills, with rock showing below the drift in many places along the shore. Another bay stretching away more than twenty miles to the north-west now joins the main body. Like the first it is full of islands, many of them composed of coarse drift. The south side of this bay is bounded by a ridge 300 feet high, and at its head a small branch falls in, which drains a number of lakes to the south-westward and forms a canoe-route to Lake Ashuanipi, on the way to the Moisie River. From the junction of the two bays, the main body of the lake extends south-east twenty miles, and then south-south-east fourteen miles. Five miles up the first course, the foot of one of two high, rocky, large islands is reached. This island is six miles, and the other ten miles long, and they practically divide this portion of the lake in two. The part on the south side of the islands averages two miles across, the northern channel being somewhat narrower. On the north side near the head of the upper island a branch called Valley River flows out. This stream is somewhat larger than the northern outlet, and constitutes the river which at present flows down the Hamilton River valley above its junction with Bodwoin Cañon. According to our guide, after passing through two lakes, together about twenty miles long and connected by rapids, it begins to fall rapidly in a succession of low chutes. About these chutes the valley is still wide, with gently sloping walls and not like the cañon on the main river. The guide had never visited the river below the chutes, but had heard that there was a high fall on it, some fifteen or twenty miles above the place at which the main body

Ossokmanuan Lake.

Valley River.

of the Hamilton River enters the valley at the mouth of Bodwoin Cañon.

Besides the large islands already mentioned, there are only a few small ones, formed of drift, in the southern half of the lake. The water is clear, but has a brownish tinge and is never very deep. A continuation of the high ridge on the west side of the north-west bay runs on southward along the west shore of the main body, but gradually dies out towards the southern end. From the lake the land rises slowly upwards to this ridge, leaving a wide interval of flat land and low shores along this portion. On the north-east side the country is lower, and is only broken by a few rounded rocky ridges that have recently been burnt over. The trees about the lake are small, and are chiefly black spruce with larch and balsam fir, but no white spruce. Balsam poplar and mountain ash are seen growing in small straggling clumps on several of the low points on the west shore. Trees.

The river enters the lake on the west side, some ten miles from its south end, where it narrows to less than two miles. Its volume is considerably greater than the channel ascended to Ossokmanuan Lake, being half as large again as the Ashuanipi Branch at the end of the survey, and flows swiftly from the south in a shallow channel from 400 to 1200 yards wide, with low banks and frequent hummocks of gneiss for eight miles, to where it leaves Lake Panchiamitkats. The country on both sides of the river is slightly higher than about the lake below, and much fine drift is seen on the islands and shores arranged in long parallel ridges from thirty to one hundred feet high, running parallel to the glacial striæ or a little east of south.

Lake Panchiamitkats is about twelve miles long and averages two miles in width, with its longer axis running due north-and-south. It is dotted with a few small islands, and has low drift shores. There is a prominent rounded hill on the west side just beyond the entrance of the river, five miles above the outlet. Another hill rises from the east shore opposite the inlet; the remainder of the country is covered with low ridges that run parallel to the lake. Panchiamitkats Lake.

The river above its entrance to this lake, flows from the west for a mile and then from the south, and is separated from the southern end of the lake by a narrow ridge only. It continues from the south for sixteen miles, to where it flows out of Lake Attikonak. Its channel is from 200 to 600 yards wide, obstructed by small rocky islands, while its shores present many rocky points. The current everywhere is strong, and the stream is frequently broken into short rapids between the many small rocky islands. Ten miles up, where the river passes over rocky ledges, there is a chute of four feet, followed by a short heavy rapid that necessitates a portage. Above the chute the current is slack and the river nearly half a mile wide, with low sandy shores, to within two miles of the upper lake, where there are two short rapids, the upper of which is wide and very shallow, as the river issues from Lake Attikonak. The country surrounding this stretch of river continues low, with long, rounded ridges from fifty to one hundred feet high. The timber is similar in kind but perhaps slightly larger than the last described.

Lake Attikonak.

The east shore of Lake Attikonak was followed in a direction a few degrees east of south for thirty-eight miles, to the head of its south-east bay. On account of the great number of islands that everywhere break its surface, no idea of its shape or size can be obtained without a complete exploration of its shore-line, which task, owing to the many deep bays in the lake, would have required more time than could be given to it. From a number of long leads seen between the islands, the lake must be at least twenty miles wide in places, and, according to our guide, its south end is considerably beyond the head of the bay where the route leaves it. A large stream flows in at the south end, which rises in lakes to the south-west of Attikonak, near the head waters of the Magpie River, flowing into the St. Lawrence; and it is used as an alternative route to and from the coast by the Indians

Large islands.

of the interior. Many of the islands in Lake Attikonak are large and high, one of them rising into a rounded hill of 300 feet, others seem to be formed wholly of fine sandy drift, with irregular outlines, and scarped banks up to one hundred feet in height. Very little rock is seen except in the south-east bay; elsewhere the shores are generally sandy, with low, boulder-strewn points. The water of the lake is clear, with a brownish colour, and does not appear to be very deep. The eastern side is bounded by low ridges of drift, with a range of hills from 200 to 300 feet high some few miles behind. At the south end of the lake, there is a sharp rugged range of hills, extending away westward, probably more than 400 feet high. The trees continue to increase slightly in size, black spruce predominating, but associated with balsam fir, larch and white birch, the last often occurring on the islands and points in large clumps with many trees up to ten inches in diameter. Near the south end of the lake, two small clumps of dwarfed aspen were seen, the first noted since the Grand Falls were passed.

From the outlet, the lake lies due south for twelve miles and is from one to three miles wide, with several deep bays running off on both sides. A large stream falls into a bay on the east side, immediately above the rapid, while another enters from the west three miles farther south. Above this the course changes to south-south-west, and continues in that direction through a labyrinth of islands for sixteen miles to a short narrow leading into the south-east bay, which was followed for twelve miles, to its head. This bay gradually narrows from two miles to less than a half mile at its head, where a small stream flows in with a short, steep rapid. The shores and islands of the lower half of the bay are formed of sand and boulders, while along the upper half they are steep and rocky, with the country behind higher and more rugged with very little drift, the bare rock rising everywhere in small knolls. Here the trees become much smaller and are wholly black spruce and larch.

Portage to Romaine River.

The route passes up the small stream last mentioned, a short distance to a very narrow shallow lake at its head. A portage of two miles, over and between a number of small rocky hills with swamps between them, joins the last lake with a little stream emptying into the Romaine River. The country about the portage has been recently burnt over, and the standing blackened trunks of the small spruce give a sort of hairy appearance to the otherwise bare rocky hills, from which all the vegetable soil has been removed, and do not add to the beauty of the scenery, which is very rugged and desolate.

Romaine River.

Upper Romaine River.

It is only a quarter of a mile by the little stream from the end of the portage to the Romaine River. The latter where joined varies from fifty to one hundred yards in width, and for two miles passes between low banks, broken by rocky knolls. At the end of this distance there is a short heavy rapid, where the river passes over a rocky ledge between small islands. A portage of fifty yards is necessary here. Below this, for six miles to the upper Burnt Lake, the banks are low and sandy and often overgrown with willows and alders. The river winds backwards and forwards with a moderate current, and has formed a delta of low sandy islands where it enters the lake. On the east side there is a large lake that is separated from the river only by a narrow low point of sand. This lake has a short discharge which joins the main stream three miles below the rapids. The country surrounding the river is slightly rolling on the west side, with rocky hills from 50 to 200 feet high. The water of the river is dark-brown in colour, and carries more suspended matter than the rivers of the eastern watershed.

Headwaters.

According to the guide, about ten miles above the place at which the portage-route joins it, the Romaine River issues from a narrow lake nearly twenty miles long, that extends north-eastward, and is called Tishinakamau Lake.

Beyond the head of this lake the river is very small, and soon breaks up into little branches, the discharges of small lakes near the head-waters of the Elizabeth and Minipi branches of the Hamilton River, and also near the sources of the Natashquan River, that flows southward into the St. Lawrence. Portage-routes connect the heads of all these streams.

The Burnt Lakes.

Upper Burnt Lake is twenty miles long and varies from one to four miles in width. From its head, for six miles, its course is east-south-east, and then changes to south-south-east to the lower end. Twelve miles from the upper end, a deep bay extends south-west for five miles. The middle portion of the lake is for several miles greatly obstructed by long islands of drift. The country surrounding the upper part is low, with long sloping hills quite different from the rounded knolls previously passed; for there is a change in the rocks of which they are composed, the former being granite, the latter gabbro. Towards the south end, the country becomes higher and rougher, with the ridges closer together. Small black spruce and larch predominate, with some white birch on the islands.

A short rapid at the south end of the lake, joins it with the second Burnt Lake, which is four miles long, with a deep bay on the west side. Another short rapid and a mile of river connects this with the third Burnt Lake, which continues southward for two miles, and then turns abruptly north-west for five miles to another short heavy rapid that flows into the lowest Burnt Lake, the south shore of which was followed westward two miles to its outlet. A long bay extends northward several miles, and a portage at its head connects with the south bay of the upper lake. The country about the lower lakes is quite rough, with sharp ridges of rocky hills rising from 200 to 400 feet directly from the water. The forest about all these lakes has been devastated by a great fire some ten years ago, and now only small patches of green woods are seen in swamps and in spots along the banks.

Character of the river below Burnt Lakes.

As it passes out of the last Burnt Lake, the river falls twenty-five feet in less than a quarter of a mile, in a heavy rapid, over huge boulders and a few ledges of rock. For seventeen miles from the lake, to where a western branch joins, the general course of the stream is due south. Half a mile below the first rapid, the river again falls twenty feet in one hundred yards, over masses of huge boulders. From here it winds to and fro, with a strong current, between steep banks of stratified sand from ten to fifty feet high, in a valley from two to four miles wide, bounded on both si 'es by steep rocky hills that rise from 400 to 500 feet above it. About seven miles above the forks, the river is broken by small rapids at intervals for nearly four miles ; here the valley is much narrower and the scarped banks are occasionally 150 feet high, with rock coming out from beneath. The west branch has about half the volume of the main stream, and enters it with a heavy rapid from a narrow valley between the hills. The trees are everywhere burnt, except in a few patches here and there, along the river-banks. They are somewhat larger, and white spruce grows on the points and islands. Distinct terraces are seen at intervals, with elevations of 10, 20, 50 and 60 feet above the present river-level, cut out of stratified sand with a large admixture of clay. Terraced drift banks.

Below the forks, the river is from 100 to 300 yards wide, and flows swiftly in a shallow channel with a sandy bottom and steep banks of the same material from ten to thirty feet high. For eight miles the general course is south-east ; it then turns south, and flows in that direction sixteen miles. At the bend there are on the west side several sharp, irregular hills of drift which extend one mile to the foot of the steep rocky hills. One of these hills cut into by the river, shows the sand and gravel to be false-bedded, and, in other places along the river, the bedding of the sands is not horizontal. These hills are thickly strewn with boulders, which do not appear to be scattered through the mass, but only over the upper surface, leading to the belief that the deposition and stratification of the drift took place in ice-water flowing under the glacier, and that the boulders on the surface were left there by the ice on its dissolution.

Below the bend, the valley narrows gradually for four miles, to two chutes, where it is less than a mile across, and is filled with sharp hummocks of drift from 50 to 150 feet high, covered with boulders. At the upper chute, the river passes along the base of a granite hill that rises sheer for 500 feet. This fall has a drop of four feet, followed immediately by another of six feet, ending in fifty yards of heavy rapids, where the descent is twenty feet. Fifty yards below is the second chute, twenty feet high, followed by heavy rapids for three miles. The banks immediately below this chute are from 50 to 100 feet high, and sections show them to be composed of re-arranged till, with false bedding; the angle is so high that in places it is impossible to walk along the foot of the cliffs, owing to the displacement and Character of the valley.

slipping of the sand along the bedding planes. Terraces up to sixty feet are numerous along the sides of the valley.

Below the rapid, for nine miles, to the next bend, the current gradually slackens, until it flows along with an even rate of about three miles an hour. The channel widens from 50 to 200 yards, and the valley also opens to nearly two miles, with sharp rocky hills bounding it on both sides, those to the west presenting high cliff-faces. The sharp hummocks of till gradually die out, leaving low and almost flat stretches to the foot of the hills on either side. The country is wholly burnt. The next bend is to the south-west for ten miles, and for that distance the river preserves the same character as above, but is slightly wider, being now about a quarter of a mile across. Six miles from the bend, a small branch, forty yards wide, comes in from the west. The old burnt woods end near the bend, but a fire of the present season (1894) has passed over all the remaining green woods below, and has practically destroyed all the forest along the river.

Extensive burnt areas.

The river now turns south for six miles to where the portage-route to the St. John River leaves it by a small western tributary. The channel along this stretch varies from a quarter of a mile to half a mile across; the river is very shallow and greatly obstructed by large sandy shoals. The valley is more than two miles wide, and the hills bounding it rise sharply from 600 to 800 feet above it. A small branch joins from the west two miles below the last bend. Below the place at which the portage-route leaves it, the river flows south-east for four or five miles, in a wide shallow channel that slowly contracts as the current increases, and finally breaks into heavy rapids where the river passes into a narrow cut between steep high hills. Nothing is known of the river for over fifty miles below this point, except that it is quite impassable for canoes, probably on account of long rapids with perpendicular rocky walls, where portages are impossible. Nothing but the absolute impossibility of passing up and down this part of the river, would induce the Indians to make use of the present portage-route between the Romaine and St. John rivers, which is the longest and worst of those known to the writer anywhere in north-eastern Canada. Careful inquiries from a score of Indians met coming inland, afforded no information concerning this part of the river, which has never been descended by any one so far as known.

Difficult portage-route to St. John River.

Portage-route between the Romaine and St. John Rivers.

Tributary of the Romaine River.

The small branch previously mentioned, was ascended from the Romaine half a mile, to a portage three-quarters of a mile long, past heavy shallow rapids. The portage passes along the west side, through burnt woods and over sandy hills that rise from 50 to 100 feet above the river on the slopes of the rocky hills bounding the narrow valley. Beyond this the stream is followed for a quarter of a mile to a portage of the same length; after which it is ascended for half a mile to a portage of one mile, followed by a stretch of river one mile long, above which the stream divides. The valley of the south branch is followed with a half mile portage, to a small lake two miles and a half long, from which a portage of a mile and a half leads over the height-of-land between the Romaine and St. John rivers. The branch, as will be seen from the above description, is full of long, shallow rapids, and flows through a narrow valley between steep rocky hills, from 200 to 300 feet high, fronted by lower hills of sandy drift, over which the portages pass. The hills along the small lake are somewhat higher and more rugged. The country travelled through is mostly burnt and the standing trees are small.

Tributaries of the St. John River.

Beyond the height-of-land, the route passes for two miles and a half through two little lakes connected by a short portage. From the discharge of the second lake, a portage of three-quarters of a mile leads up hill to a small pond, and then down hill across the discharge of the last lake to the foot of a high fall. Next follows a short stretch of river, with a three-quarters of a mile portage past heavy rapids, closely followed by three short portages, past chutes. These portages, though short, are exceedingly bad, going straight up and down the rocky walls of a narrow gorge, over great blocks of anorthosite. The last ends in a narrow lake hemmed in by rocky walls that rise sheer from 500 to 800 feet above the water, and often present over-hanging cliffs, the sides being partly wooded with small spruce and birch that form a pleasing contrast to the bare rock elsewhere. In many places great blocks have been detached from the cliffs and are heaped up at their base. A number of small streams fall perpendicularly over the cliffs.

At its discharge, the river falls seventy feet in as many yards, through a narrow pass partly filled with huge angular blocks. The portage is along the side of the cliff, often straight up and down, over blocks and through the water, the whole making the worst possible combination of obstacles. Below the portage, the river is followed for a mile and a half to its junction with a larger stream from the west. Just below the last-mentioned portage a large stream falls in from the east with two chutes over 300 feet high. Lower down, a smaller stream comes in on the same side with a higher fall, which shows that the valley is much below the general level of the surrounding country.

The next portage leaves the river a short distance above the western branch, and in three-quarters of a mile ascends over 300 feet, ending just above a high chute on the west branch, where it falls, down a narrow gorge, to join the other branch below. This stream is then ascended for four miles, with two short portages past rapids on the way, before reaching Cliff Lake, which is eight miles long and from a half to one mile wide. The scenery about this lake is very striking. Both sides are formed of vertical cliffs, often rising sheer from 500 to 600 feet above the water and terminating, in the higher points, in bare, rocky knolls, without a particle of soil. In many places great masses of rock have broken away, and are now piled up in confused masses that extend far out into the lake. At every depression in the walls of the valley, little streams fall into the lake and are fringed by small trees of spruce and birch, which also grow along the edges of the lake and in rocky crevices up the sides of the cliffs.

Cliff Lake.

The small stream that flows in at the head of the lake is ascended for three miles, through two small lake-expansions, to a portage of one mile ending in a very small lake at its head. The next portage is two miles and a half long, and follows a valley between high hills, first ascending to the head-waters of the stream last followed and then down another small brook flowing in the opposite direction. This portage, besides being long, is very rough, leading over broken rock and through swamps. It ends in a small lake, out of which a little river fifty feet wide issues and flows southward with a winding course and strong current, in a deep valley about one mile wide. Its banks are low and generally sandy, and the valley is covered with a thick growth of small black spruce, larch, balsam fir and white birch, somewhat larger than any previously seen on the route from the Romaine River, but still too small to be of any commercial value. This little river was descended for eleven miles to where it is joined by a small western branch, which was ascended for one mile, through a shallow lake. Thence a short portage leads to another very small lake on the same stream, followed by still another portage of a third of a mile into a third small lake at the head of the stream.

Trees.

A portage two-thirds of a mile long next leads up hill to another small lake, from which a portage of three miles follows the stream issuing from it, and descends 600 feet to the next lake below. There is here a general fall in the surface of the country and a change in the outline of the hills, as the route passes from the rugged anorthosite area, with its high knob-like hills, to the lower and more rolling country underlain by gneiss.

The lake at the foot of the portage is a little over two miles long, and its discharge is followed four miles and a half, with five portages past shallow rapids. A portage of a half mile passes up from the stream over a hill 300 feet high to a lake 100 feet above it. This lake and its outlet are followed three miles, with two short portages on the way, to the last portage to the St. John River, which leaves the small stream and passes down a steep gully cut out of drift for about one mile, where it descends 365 feet to the level of the St. John River

Portages to the St. John River.

The total number of portages from the Romaine to the St. John is thirty-one, and their combined length aggregates nineteen miles and a half.

St. John River.

The St. John River, where the portage-route joins it, is about 100 yards wide and pursues a winding course in a valley about one mile wide, bounded by steep hills from 200 to 500 feet high.

St. John River.

There is a great accumulation of drift in the valley, out of which the shallow channel of the stream is cut. The banks are mostly low where the river crosses the valley, and are high only at the bends, where sections from ten to sixty feet deep show stratified sands overlying clay.

A few mil s above the portage, the river is broken by heavy rapids and chutes, and is almost impassable for canoes. Below, the gradient of the valley is steep, and the river in consequence has a strong current, especially at the bends, where it generally falls with short rapids through narrow channels cut out of the shingly shoals that obstruct it. It greatly resembles the rapid-flowing streams of the Gaspé Peninsula. Eight miles below the portage a large branch joins from the east, the head-waters of which form the various streams of the portage-route already described. Below this branch the channel widens somewhat and continues to wind from side to side in the valley for twenty miles; the hills then close in, and the river descends a narrow gorge, with a heavy rapid ending in a fall of twenty feet.

The trees in the valley show a marked improvement both in size and variety. White spruce fifty feet tall and from twelve to eighteen inches in diameter is plentiful, along with larger black spruce, balsam fir, larch, white birch, balsam poplar and aspen. The sides of the valley are more than half burnt.

Trees.

The portage past the chute is nearly a mile long and passes along the almost perpendicular side of the valley some 300 feet above the stream. The ascent and descent at both sides is so steep that the Indians are forced to cut steps out of the soil in order to pass over with loads. In the middle it is close to the rocky wall, and the road has been made by placing logs along narrow parts, which almost overhang the boiling stream far below.

Salmon Branch.

A mile below this portage the Salmon Branch joins from the west. It has a deep valley like the main stream and is considerably smaller. About a mile below this branch there is a salmon fishing camp, with a fine large house situated on a wide bank at the mouth of a small stream, the resort of sportsmen during the summer.

From the chute the general course of the river-valley is almost south for twenty-five miles, to the coast. The valley is narrower than above, and for ten miles does not exceed half a mile, with walls of anorthosite rock rising in nearly perpendicular cliffs from 300 to 600 feet above the water. As the coast is approached, the valley widens and the hills become lower, so that a short distance below Chambers River, or ten miles from the mouth, the rocky hills give place to banks of stratified clay and sand that gradually decrease in height down to the sea.

The country surrounding the river has been over three-quarters burnt, and the remaining forest is very similar to that already described.

The river from the chute to its mouth varies from 200 to 400 yards in width. It is quite shallow and has a very rapid current, with many short rapids, as it winds from side to side in the valley. The limit of tide is eight miles and a half above its mouth.

Manicuagan River.

Position of the mouth.

The Manicuagan River flows into the St. Lawrence about two hundred and forty miles below Quebec. Within ten miles of their mouths, the Manicuagan and Outardes rivers are separated only by a high sand plain, about two miles across. Above and below this place, their courses diverge, so that their mouths are fifteen miles apart, and the land between forms a broad peninsula composed of stratified clay and sand, evidently brought down by the rivers. The channels, thus diverted, instead of passing out into the Gulf of St. Lawrence, hug the shore for several miles with wide sandy shoals outside. The Outardes water flows westward, and that of the Manicuagan River towards the east. Owing to the channels being in-shore and to their broadening as they leave the mouths of the rivers, it is impossible to approach within ten miles of either stream with large vessels, while anchorage is dangerous outside on account of insufficient holding ground, the bottom being sandy.

From the mouth of the Manicuagan River, where the stream is about three miles wide and greatly obstructed with shoals bare at low water, the course is directly west for four miles, to where the rocky point projecting from the north side narrows the stream to less than half a mile. Above this, the west course continues two miles, with rocky banks and, towards the upper end, with a number of small rocky islands, between which the river flows with a rapid current. A sharp bend to the north now leads to a succession of heavy chutes that obstruct navigation for the next two miles. The river, while passing the chutes, rushes through a narrow gorge from 200 to 300 feet wide, with low rocky walls. The highest direct fall is about 30 feet, while the total descent is 110 feet. The volume of water passing down is very great, being over half that of the Ottawa at the Chaudière Falls. The portage is divided into two parts, the upper half being only used during high water; at other times short portages are made up or down this part of the gorge.

Volume of water.

A short distance above the upper portage, a road climbs a high bank of modified drift, and leads to the Outardes River, some three miles distant. This route is frequently used by the Indians, to avoid the long coast journey, from the mouth of the Manicuagan River to Bersimis, where they reside during the summer months.

Above the portage the river widens to about 500 yards, and continues from the north for five miles, after which the valley bends to the north-east, for a similar distance, to the next portage. Several long islands of drift occur in the upper half of the stretch between the portages. The valley is about one mile wide, bounded by rounded, rocky hills, 600 feet high and flanked by thick deposits of stratified clay overlain by sand. These superficial deposits are terraced at frequent intervals up to an elevation of 350 feet above the water-level. The clay deposits do not rise more than 100 feet above the river and are horizontally bedded. The banks and hills are well wooded with large trees of the following species, arranged in their order of abundance:—White birch, white spruce, aspen, black spruce, balsam poplar, balsam fir, yellow birch, Banksian pine, white pine and black ash. Many of the spruce trees are sufficiently large to afford good commercial timber. The current along this stretch gradually increases from two to four miles per hour as the stream is ascended.

Timber.

The next portage is about two miles long, and, for the greater part of its length, passes over a sandy plain 320 feet above the river at its lower end. Steep hills of clay and sand are found at either end, and, being constantly wetted by small streams, are very difficult to ascend or descend with heavy loads. The river here again passes, with heavy rapids and chutes, through a low rocky gorge ; the fall is 165 feet.

Above the portage the valley again widens and the next portage is thirty miles farther up. The course of the valley for the first nine miles is due north ; its walls are from half a mile to one mile apart, rising in abrupt rocky cliffs from 600 to 1000 feet, the river flowing close to the western wall, with a wide interval of sandy bottom-land intervening on the east side. The stream varies from a third of a mile to half a mile in width, and its channel is broken in many places by sandy shoals. The current is even and averages about three miles an hour.

Toolnustook River.

The valley next bends to the north east for four miles, and again to the north for six miles, where a large branch called the Toolnustook or Elbow River, joins the main stream. This branch comes in through a deep valley from the north-east, and takes its rise in the same lake out of which the Godbout River flows. Along the lower bend of the stream, the mountains forming the western wall of the valley are greatly broken and rise in detached rounded hills more than 1000 feet above the river. One of these mountains, immediately at the bend, towers upwards, with bare rocky walls, directly from the water, and is named by the Indians the "Manitou Pulpit." Above the bend the valley widens to more than two miles, and continues so to the mouth of the Toolnustook. Wide terraces occupy both sides between the hills and the water, and are covered with a fine growth of trees similar to those named above. The current quickens as the fork is approached, and there flows steadily at a rate between three and four miles an hour, in a shallow, sandy channel. Above the forks, the main valley changes its direction to nearly north-west, and for the next twelve miles averages a mile wide, with high rugged hills of anorthosite forming its walls. The river here varies from 200 to 300 yards in width, and flows with a very strong current, as it winds from side to side down the valley. At each bend it reaches the rocky walls, while elsewhere it has high banks cut out of the heavy deposits of stratified clay and sand, which partly fill the valley in the form of terraces, of which the highest is 150 feet above the river.

Chesniup Portage.

At the end of this stretch a high bank of terraced drift extends almost across the valley, apparently filling the old river-channel and forcing the stream through a narrow rocky gorge on the east side, where it descends 115 feet, in a succession of five chutes in about half a mile. The portage, named the Chesniup Portage, passes along the side of the west bank, where the terraced drift rises 250 feet above the water.

For thirteen miles above, the river continues narrow, crooked and swift, with frequent short rapids and a couple of dangerous whirlpools, in a valley from a quarter to half a mile wide, surrounded by irregular, rounded hills from 400 to 500 feet high. Down every depression between the hills on both sides, small streams fall in beautiful cascades from the higher lands surrounding the valley. The drift, along the lower half of this stretch, is not heavy, and narrow terraces are cut into it up to about one hundred feet above the present level of the river. As the upper half of the distance is ascended, the valley widens, and the rocky walls are somewhat lower and more regular. With the increased width of the valley the channel also widens to a quarter of a mile and the current slackens. The valley now straightens, and for twenty miles runs slightly east of north, widening to nearly two miles, with regular rocky walls on either side. The river along this portion averages half a mile in breadth ; it is very shallow, and is broken by a number of low, sandy islands and shoals. The current is even and moderate, and the banks are low, rising in wide terraces to the rocky walls. About six miles up this stretch a burnt area is entered, which extends up both sides of the valley, leaving only a narrow fringe of green woods at intervals along the river-margin. The timber in the valley and on the hillsides is all of fair size, and much of the white spruce is of good quality and in sufficient quantity for profitable lumbering. Black spruce predominates, followed in decreasing order by white birch, aspen, white spruce, balsam fir, larch and Banksian pine. The northern limit, in this valley, of white pine, yellow birch and black ash appears to be along the crooked stretches close to the Chesniup Portage.

Character of the river valley.

About half way up the last described stretch, a portage-route leaves the river on its west side, and, after passing over the wide, sandy plain, ascends a gulley in the hills to a small lake on the table-land, some 500 feet above. Thence two or three other small lakes are passed to a larger one, called Tetiskouskua, the outlet of which is descended to the Outardes River. This is the route followed by the Indians who hunt along that stream, in order to avoid the many long portages along its lower part.

Portage-route to the Outardes River.

The valley next again turns more to the eastward, and then bends to the north for twenty-four miles, to the next portage. It narrows, and the river becomes deep with a rapid current. The lower part of the valley contains much drift, which is in part terraced to a height of 200 feet above the river. Clay is no longer seen ; the stratified sands extend downward to the water's edge, and are often capped with thin beds of fine gravel. In most places the bedding is nearly horizontal, but in a few places the angle of bedding is considerably inclined and the drift appears to have been, at least in part, deposited under or in cracks of the glacier. The walls of the valley are still rocky, and vary from 500 to 800 feet in height. Much of the forest has been destroyed by fires at different times, the latest having occurred about fifteen years ago. The older burnt areas are grown up with thickets of small white birch, aspen, black spruce and Banksian pine. On the unburnt portions the trees are considerably smaller than those already noted, and the quantity of white spruce is much less, black spruce predominating.

Branch Portage.

The next portage crosses the neck of a small peninsula, formed by the main stream and a branch which comes in from the east. The portage is about half a mile long and passes over a level plain of sand 250 feet above the river at its lower end. The upper end of the portage comes out on the small branch, about fifty feet wide and very deep, which winds with a sluggish current between high sandy banks, for nearly two miles, to where it joins the main stream. The river just below passes into a very narrow, rocky gorge, where it descends 175 feet in less than two miles.

From the mouth of the small branch to the next portage, the distance is five miles and the course of the valley about north-west. The valley is narrow, and the hills on either side rise in almost perpendicular cliffs, directly from the water, to heights ranging from 500 to 1000 feet. A little drift is seen, terraced to 100 feet, and through this deep, narrow valley the river rushes in a deep channel, with many stretches of broken water.

Kikaskuatagan Portage.

The next portage is called Kikaskuatagan, and is nearly a mile long. It starts from a steep, rocky ledge, where, owing to the constant heavy swell, unloading is very dangerous. The road leads up a narrow gully filled with rough broken rock, and ascends almost perpendicularly for a hundred feet to a sandy terrace, which it follows to the head of the portage, where a steep drift hill is descended. The river at this place falls about twenty feet, with heavy rapids, where the channel is obstructed by numerous boulders. During high water the lower end of the portage cannot be approached, and at such times a gully more than half a mile lower down, is used to reach the terrace. Above this portage the direction of the valley changes to north-north-east for eleven miles. For the lower six miles the river averages 100 yards in width, and flows in a deep channel at the base of the western wall, which here rises in perpendicular cliffs from 300 to 600 feet high, with numerous small streams falling in narrow white ribbons of spray into the river. The eastern hills are less abrupt and are flanked by a good deal of sandy drift, terraced to one hundred feet above the river. Along the upper five miles of this course, the valley widens and contains much drift; the grade of the river is here very heavy and, as the bed widens, it becomes divided into numerous channels by low shingle bars, over and between which the stream rushes at a rate of five or six miles an hour, so that it is exceedingly difficult to ascend with loaded canoes.

The course of the valley next changes to north-west and continues in that direction seven miles. A short distance above the bend, the walls again approach and, two miles above, are less than a quarter of a mile apart. As the stream is ascended, its channel narrows and deepens, and it flows very rapidly between steep banks of boulders or rock for four miles, to where the Long Portage leaves it. Above the lower end of this portage the stream is still more contracted, and is walled in by steep rocky cliffs on both sides, where it is impossible to enter or leave the valley with canoes for the next three miles. In this distance the river is interrupted by a number of low chutes, which at low stages of water can be passed with canoes in descending. The portage leaves the valley on its east side, at the mouth of a small tributary. A sharp ascent of 250 feet leads to a terrace of coarse sand and gravel, formed along the flank of a rocky hill. This terrace is followed about one mile, and then a sharp bend to the north carries the road, in the next half mile, over the shoulder of the hill, to a small lake 560 feet above the river. A short portage leads from this lake to a slightly larger one, from the north side of which another portage one mile and a half long again leads down to the river, after first passing over a flat drift plain between the hills. The trees surrounding the lakes are mostly small black spruce, with a few fir, larch and white spruce, none of which are of commercial value. Long Portage.

Above the Long Portage, the still contracted valley stretches due north for three miles, when it changes to north-north-east for eight miles, to the next portage. The river, along the lower half of these distances, is deep, narrow and very swift, with steep banks of rock or large boulders. Along the upper half it alternates between long stretches of quiet water, and short rapids, where heavy banks of coarse drift project out from the sides, contracting the channel. Character of valley above the Long Portage.

The portage, at the head of these courses, is about 100 yards long, and passes a heavy rapid full of large boulders, where the stream falls over a low ledge of rock. From here, to the outlet of Lake Ichimanicuagan, six miles above, the valley continues in the same direction as the last course, and gradually widens to about one mile. The hills forming its sides rise very abruptly from 600 to 1000 feet, and in most places their sides are bare rock, with straggling spruce and birch trees growing here and there in crevices. The river gradually widens, and after a short rapid, about two miles above the portage, its current slackens, and it passes imperceptibly into the lake. The rocky walls are flanked on both sides with some quantity of drift, cut into terraces at various heights, up to 150 feet above the water, these terraces being well wooded with spruce, aspen and birch. Numerous large trees of white spruce grow on the lower terraces, many of them more than thirty inches in diameter three feet from the ground.

Lake Ichimanicuagan.

The view at the outlet of Lake Ichimanicuagan is one of great beauty and grandeur, the quiet water of the lake contrasting in colour with the bright sandy shores, backed by the dark green of the spruce and the lighter-coloured birches and aspen, while the rocky walls of the valley rise abruptly on both sides, bold and bare, with a fringe of small trees crowning their summits. Out of every depression in the hills above a stream issues, falling in most places directly down the rocky walls from 300 to 800 feet. One stream in particular, on the east side, is of considerable volume and has a sheer fall of upwards of 500 feet. In its descent it dashes against the almost perpendicular wall, and, by the time it reaches the lower level, is completely broken into spray.

Lake Ichimanicuagan is the lower of the two great natural reservoirs which collect the waters of the upper portion of the Manicuagan River. The lake lies in a deep narrow valley, a continuation of that of the river lower down. The water surface is 685 feet above sea-level, and nearly as many feet below the level of the surrounding country. This lake was not examined by us, but was surveyed in 1872 by John Bignell, P.L.S., and was found by him to be sixty-three miles long, while its breadth varies from half a mile to two miles, giving an average breadth of one mile, the southern half being the narrower. The lake is crescent-shaped, so that a line drawn from the two ends runs nearly north-and-south, while the convexity of the curve is towards the east. The principal river flowing into the lake, enters it on the west side, about four miles above the outlet, and forms the discharge of Lake Mouchalagan, the upper large lake. The other large streams entering the lake are three in number, but they do not compare in volume with the last mentioned. Two come in on the east side: the lower, called Gabriel River, enters about half way up; the other, called Wachaogamau River, flows in about ten miles from the north end, and is used by the Indians as a route crossing to the head-

Previous surveys.

Tributaries.

waters of the Ste. Marguerite River. The third river flows into the north end, and is exceedingly rapid, as it descends quickly from the table-land to the level of the lake. It rises some forty or fifty miles to the north and north-east, in a number of lakes, of which the waters interlock with those of the main stream on the west, the Ste. Marguerite on the east, and tributaries of the Koksoak River on the north.

Mouchalagan River.

As stated above, the main stream, flowing into Lake Ichimanicuagan, comes in from the west about four miles from the outlet, This river, which equals at least three-quarters of the volume of the outlet, enters the lake through a deep narrow gorge, nearly at right-angles to the main valley, and also cuts almost directly across the strike of the rocks. For three miles above the lake, the valley is not over 200 yards wide and is walled in by rocky hills, which on the north side rise in perpendicular cliffs from 800 to 1000 feet; the south wall is equally high, but less abrupt, and is about one half wooded with small spruce and birch. The river has an average breadth of one hundred yards, and flows swiftly in its deep narrow channel, which is frequently partly blocked with huge masses of angular rock, fallen from the overhanging cliffs of the north side. Several small streams tumble in from the high lands on the south side, in series of beautiful waterfalls. After three miles, the valley curves gently towards the north for four miles, widening in so doing, and thus allowing for a narrow interval of terraced drift between the river and the walls of the valley. The east wall continues abrupt, but farther up the stream it gradually decreases in height, and the scenery loses much of its wild grandeur. The course of the valley next changes to nearly north-east; here it widens, and its walls become lower and much less rugged, so that in the upper part, the surrounding hills do not rise more than 500 feet above the stream, and have well wooded, rounded outlines. The current throughout is swift, and two miles up this course, a large ledge of rock, crossing the stream, causes a low chute and heavy rapid, passed by a portage of one hundred yards on the east side.

Upper rapids.

At the upper end of the course, the stream bends quickly to the north-west, and for more than a mile is broken into broad low chutes and heavy rapids. This obstruction is passed by a portage nearly a mile long, of which the lower end is found a short distance up a small stream which flows in on the west side at the foot of the rapids. The portage rises rapidly 170 feet, to the level of a flat sandy terrace, and then crosses northward, on the level, to the river, where a sharp scarped bank of sand is descended.

From the upper end of the portage, the stream gradually bends to the westward for the next five miles, to where it flows out of Lake Mouchalagan. Along this portion the banks are not high, and the rounded rocky hills are quite distant, so that the country on either side of the river is low and flat, and is thickly wooded with spruce, Banksian pine, fir and birch, somewhat smaller than before noted.

Lake Mouchalagan.

Lake Mouchalagan is not as long or as large as the lower lake, but, notwithstanding, contains a great volume of water. Its greatest length is forty-one miles, and its average breadth about one mile, being least in its southern half, and varying from one mile and a half to two miles in the northern part. In shape this lake also resembles an irregular arc, but with the convexity towards the west ; on account of the opposite bends in these long lakes, their northern ends approach within fifteen miles of each other, and the interval there is occupied by low lands covered with lakes.

Height above sea.

The level of the lake is 830 feet above the sea, and its water is remarkably deep. Soundings made off Partridge-tail Hill, on the west side, about fifteen miles from the north end of the lake, give a depth of 466 feet, at one hundred yards from shore ; while at a distance of 500 yards the depth is 655 feet, the greatest known depth of any lake in the Labrador Peninsula. The water is clear, with a brownish tinge.

Fish.

Owing to the great depth, but few places are suitable for the setting of nets, and consequently the fisheries are not well known to the Indians except in the northern part, where the sand brought down by the principal tributary has silted up the bottom and produced shallow water over a considerable area. Here large quantities of lake trout, whitefish, land-locked salmon, pike and suckers are taken in nets during the spring and autumn.

The shores of the lake alternate between wide rocky points and sandy bays, and the banks in most places rise in terraces cut out of thick deposits of drift that flank the rocky hills on both sides. The highest terrace is about 150 feet above the present level of the lake, and it is seen on both sides in all favourable localities.

The hills are, for the most part, well rounded, but broken by deep valleys, those on the west side rising from 200 to 500 feet above the water. On the east side they are low and regular until the middle of the lake is reached, where a range of high irregular-shaped hills of rusty garnet-diorite occupies the country back from the shore for more than ten miles, when they again die away in the low lands at the head of the lake. To the north of the lake a low flat country extends for some ten miles, to the foot of a high irregular range of hills, which, from their outline and white colour are believed to be formed of crystalline limestone—an extension of the hills seen along the river above the lake and described later. Over three-quarters of the country surrounding the lake has, within the last three years, been devastated by fire, and in consequence only blackened trunks are seen in most places. The timber remaining is chiefly black spruce, seldom exceeding twelve inches in diameter, together with white birch, balsam fir, aspen, Banksian pine and a few larch, all growing thickly, but small in size.

Tributaries.

A number of small rivers enter the lake, generally with falls close to their mouth. Most of them come in on the west side, and one of them, which enters a few miles south of the Partridge-trail, forms with its connected lakes, a route to Outardes River. The main stream, or Mouchalagan River, flows through a wide, flat valley on the west side, about five miles from the north end of the lake.

Kawikwanipinis River.

As before stated, wide shoals extend for more than a mile into the lake, dividing the stream into narrow channels, which render an approach difficult during low stages of water. For the first four miles from its mouth, the stream flows from the north-north-west in a channel more than a quarter of a mile wide, with low scarped shores and sandy shallow bottom, with a moderate current. At the head of this course, a large branch, called the Kawikwanipinis River, joins from the north-east. Its volume appears to be about one-quarter of the main stream below its junction. It is about 100 yards wide and averages six feet in depth, with a current of two miles an hour.

This river, a short distance above its mouth, passes in a deep narrow valley, between high rugged hills of white crystalline limestone. From information obtained from the Indians, who hunt along the stream for many miles above its mouth, it is a succession of long heavy rapids and quite unnavigable, until near its head, where it flows out of a large lake called Mishinik, some fifty miles to the north-east of its mouth and close to the northern watershed. From the north end of this lake, portage-routes through small lakes lead north and north-east into the headwaters of streams flowing north into the Koksoak River, and eastward into the Moisie River. The portage-route to Lake Mishinik and past the rapid lower part of the river, is by a small tributary which joins the main stream fourteen miles above the Kawikwanipinis. This route is exceedingly long and rough, and quite impassable during the summer months for heavily loaded canoes, owing to the shallow streams and lakes connected by more than fifty portages, many of which are long and pass through deep swamps. The Indians wait at Lake Mouchalagan until winter sets in, and then haul their canoes and outfit over the portage-route, returning in the spring in their canoes. At this time they carry out only the furs caught during the winter, and in consequence pass over the portages in one trip.

Above the Kawikwanipinis, the main stream, for the next fourteen miles up to the small tributary above mentioned, has a general direction from the north-west, with a number of minor bends on both sides of the course. It now enters a distinct valley, which narrows from a mile to less than half a mile across as the stream is ascended, with rocky walls from 300 to 500 feet high, often with perpendicular cliff-faces, especially along the upper half of the distance, where white crystalline limestone and rusty, decomposed gneiss are the prevalent rocks.

High cliffs.

For five miles above the forks, the channel averages 200 yards in width, and a steady current flows over the sandy shallow bottom; farther up, the stream is broken into numerous channels by long islands of drift, often well wooded with medium-sized white spruce and white birch. The current here becomes swift with short shallow rapids, and poling is necessary in ascending with canoes. In many places thick sections of false-bedded sands and gravels are exposed in the scarped banks, and well-marked terraces were noted at 10, 20, 40, 60, 70, and 100 feet above the stream. The lower terraces are thickly wooded with trees similar to those found on the islands, along with black spruce, which predominates on the upper terraces and on the rocky sides of the valley. About one-half of the forest in the valley has been recently burnt.

The valley now turns due west for two miles and a half, and then nearly north for three miles and a half. Throughout these distances the river passes through a narrow rocky gorge with walls rising from 200 to 500 feet. The channel, in ascending, first narrows to about fifty yards and continues so for more than a mile. The current is very strong, and increases into a heavy rapid, with a low chute where the stream passes over a ledge of limestone. Above the chute the stream widens to 300 yards and is broken into numerous shallow channels by gravel bars and masses of coarse blocks and boulders. The stream here descends with heavy rapids. At the bend, the valley and river again narrow, and the latter varies from ten to 100 yards in width as it passes down over a number of short chutes connected by heavy rapids. With this character the stream continues to the head of the gorge, where the valley gradually opens up, and as it widens it becomes free from rocky ledges. This portion of the river can be navigated with canoes only at low stages of water, as then only can portages be made over the rocky margins between the steep walls and the water at the chutes.

Gorge.

The Indians never use this part of the stream; they pass it by a portage-route of which the lower end leaves the main stream on its east bank a few yards above the mouth of the already-mentioned tributary. The portage is short and ends on this stream, which is followed northward for a mile and a half in a direct line, but, owing to the stream winding from side to side in a valley about half a mile wide, the distance by water is more than four miles. The direction of the route now changes to north-west and continues nearly so to the head of the gorge. From the stream a portage of a mile and a half leads to a small lake 450 feet above the river. The route next passes through three small lakes connected by short portages, for two miles, and then by a portage of a mile and a half down hill to the river. The country surrounding the lakes is characterized by rounded, rolling hills partly covered with small black spruce and larch, with a few birch trees. Portage past the gorge.

From the head of the portage, the valley runs nearly due north, and quickly widens out to nearly one mile, with its bordering hills rising gradually on both sides to heights varying from 300 to 600 feet. The river has an average width of 400 yards for the next five miles, up to where the main portage-route leaves it. The channel is shallow and greatly broken by drift bars and low wooded islands, with a very swift current that averages five miles an hour and is occasionally broken into short rapids. Between the hills and the water there are wide intervals of terraced drift, the highest terraces being about 100 feet above the water. Scarped banks show the drift to be chiefly fine sand, with occasional beds of small gravel near the top, all showing signs of bedding at various angles to the horizontal. The trees in the valley continue to be of fair size and are chiefly black spruce, with white spruce, balsam fir, white birch, aspen, larch and Banksian pine.

The main stream, a few miles above where the portage-route leaves it at the head of this stretch, becomes very rapid, and flows in a deep, narrow gorge, with high, steep, rocky banks, where it is impossible to ascend with canoes, and very dangerous to descend. On this account, the Indians make use of a long and difficult portage-route, in order to reach the upper waters of the river. This route was passed over in ascending to the watershed, and will be described further on. Portage-route to head of river.

Above this portage-route, the valley continues northward for seven miles. Along the lower part it is somewhat wider than the portion last described, and the river is also broader, with high drift banks, from beneath which rounded masses of rock outcrop at intervals.

Along the upper three miles, the valley gradually narrows and the drift on the banks of the stream give place to rock, which hems it in and, as the grade is heavy, causes it to form wild rapids in a channel less than 100 yards wide.

Pepechekau River.

On the east side, about one mile below the upper end of the course, a large branch called the Pepechekau River, enters the valley with a beautiful fall of fifty feet. This stream heads in the neighbourhood of Mishinik Lake, to the north-eastward.

The valley, for the next twenty miles, runs almost straight north-north-west, with only a few minor bends. For the whole distance it never exceeds 400 yards in width in the bottom, and for many long stretches is less than one hundred yards across, with high, rocky banks rising abruptly from 300 to 600 feet, to the level of the irregular table-land above. The grade of the valley is steep, and down it the river, much confined, rushes in wild, heavy rapids, broken occasionally by short, low chutes. The shore is rocky, and broken with small, irregular points, past which the water rushes with great velocity and thus forms dangerous whirlpools. This portion of the river is exceedingly dangerous to travel, owing to the impossibility of making portages in most places, on account of the high, perpendicular walls of the valley and of the absence of any beach between their foot and the water. During the descent of this portion of the river it was only with the greatest difficulty and danger that the frequent landings necessary for the survey were made, and disaster was avoided in a number of places only by good luck. At a rapid pitch about half way down, one canoe was accidentally upset, and Paul Bacon, an Indian guide, was most unfortunately drowned in the whirlpools. Although the river was carefully searched below, no trace was found of the body of the unfortunate young man, nor of the canoe or its contents, which must have been caught in some of the eddies and sunk out of sight beneath the deeply-eroded, rocky banks.

Dangerous rapids.

Along the upper mile of this course, where the river first passes into the cañon, it falls 140 feet, in a succession of chutes over rocky ledges, the stream being broken into a multitude of channels by small rocky islands. The trees along the walls of the cañon are chiefly black spruce and a few white birch, with an occasional tree of white spruce along the lower portion.

Above the head of this gorge, the hills on both sides fall away, leaving a valley several miles across, bounded by broken ridges of rounded hills from 100 to 500 feet high. The valley is filled with a great accumulation of drift arranged in low ranges of drumlin-like hills, covered with boulders. The river now spreads out, and is broken into numerous channels by the detached drift ridges, so that for the next fourteen miles it assumes a lake-like character, although everywhere the current is perceptible and in many places strong. This portion is called Natokapau. The stream continues to flow from north-north-west for eight miles, to where a large branch called the Attikopi River joins it from the westward. The main stream, or Itomami Branch, then changes its direction and flows almost due south. Several large streams from the surrounding country join the main river in this neighbourhood. On the west side two flow in below the Attikopi River, and drain small chains of lakes on the high lands, through which a portage-route passes to join the Attikopi River. Two other streams enter on the east side, within a short distance of the commencement of the cañon, while at the upper end of Natokapau a large branch called the Mossy-pine River, joins from the north-east, where it is said to head in several long lakes on the watershed, one of which, at least, also discharges northward into the Koksoak River.

Notakapau.

Branches.

Above the Attikopi, the main stream flows in short crooked courses down a valley from one to four miles wide, bounded by rounded hills from 200 to 500 feet high, that run in broken ranges parallel to the direction of the valley, or north-east and south-west. The lower lands surrounding the river are covered with ridges of drift, often largely formed of coarse boulders and angular blocks of rock. The summits of all the higher hills rise above the tree-line and are covered only with low arctic willows and shrubs. The trees growing on the low lands are small and stunted; over ninety per cent are black spruce, with a few larch and Banksian pines, and an occasional clump of small straggling white birch. The aspen is not found above the mouth of the Attikopi River.

The valley continues in a north-east direction for forty miles, up to the watershed, beyond which it was seen holding the same course for at least thirty miles farther.

Character of the upper river.

Above the Mossy-pine River, the main stream is about one hundred feet wide in rapids, where the average depth is under two feet. Immediately above its junction there is a short heavy rapid leading from a small lake-expansion connected by short rapids with three others in the next seven miles. Above these, for twelve miles the river is narrow and blocked with small islands and huge boulders, past and over which it pours in continuous heavy rapids. It then flows out of the lower of a series of lake-expansions that almost fill the bottom of the valley, and are only separated from one another by short heavy rapids. These continue for ten miles, until the outlet of Lake Itomamis is reached. This lake is five miles long, and from one to two

Itomamis Lake.

miles wide, with several small irregular bays stretching away from the main body. It is surrounded by barren-topped hills that rise from 200 to 500 feet above it. Low shores, backed by drift ridges, intervene in many places between the water and the surrounding hills, and they are covered by patches of stunted black spruce and a few larches. The lake is fed by two large and a number of small streams. The largest flows in on the west side, near the south end, and forms the outlet of a chain of lakes on a portage-route to the head of the Attikopi River as described further on.

The second large stream flows into the north end of the lake, and, by two short rapids and a small lake-expansion, connects this lake with Itomami or Summit Lake, so called on account of its waters discharging in opposite directions; the southern outlet forming the head of the main branch of the Manicuagan River, the northern flowing into Lake Kaniapiskau, and thence into Ungava Bay. The streams flowing out are about equal in size and volume, being about ten feet wide in the rapids of both discharges.

Summit Lake.

Summit Lake is cut by the 53rd parallel of north latitude. It is six miles long, and averages about one mile in width, with two lateral bays, which increase the width in the centre to three miles. It is estimated to be 1940 feet above sea-level. Like the lower lake, it is surrounded by rugged, rocky hills, arranged in roughly parallel ridges. These hills are all barren on the top; on the low lands surrounding the lake small black spruce grows, but only in open groves. A great part of the timber has been destroyed by fire, and the landscape has a most desolate, barren appearance.

Country about the watershed.

From the summit of a hill that rises 565 feet above the water, situated on the east side of the lake near its north end, a fine view was obtained of the country about the watershed. The valley of Itomami is seen continuing in a north-north-east direction for more than twenty-five miles; beyond, it appears to bend towards the north, and a chain of long narrow lakes partly fills the valley, down which they discharge into Lake Kaniapiskau. Another wide valley stretches off towards the north, with two large lakes, the upper of which appears to be about 200 feet above the level of Summit Lake, into which it drains. To the westward are two more lakes, the lower separated only by a narrow strip of sand from Summit Lake. To the south, there is a narrow valley containing a chain of small lakes. With these exceptions, nothing is seen in all directions but rounded, barren-topped mountains, apparently considerably higher to the east, north-east, and north than about the lake, and the elevation of these mountains may vary from 300 to 600 feet above the lake, or from 2000 to 2500 feet above sea-level.

Attikopi Branch.

This stream, as before mentioned, joins the main river in a small bay at Natokapau. At its mouth there is a short rapid where the river passes down a channel about one hundred feet wide, over and between large boulders. For ten miles it flows in an irregular channel between low ridges of drift, thickly strewn with boulders and angular blocks of rock, on its way down from Lake Attikopi. The stream is greatly broken by rapids and chutes, and descends over 250 feet in the ten miles. The grade of the upper half is the heavier, and low ledges of rock along this portion cause frequent chutes. In all six portages, aggregating four miles in length, are necessary to pass these obstructions. Besides the low boulder-strewn ridges, occasional low hills of rock rise above the general level, and become more marked as Lake Attikopi is approached. Junction with main river.

This lake is very irregular in shape, and its surface is broken by many rocky islands. A long point, stretching out from the south side, divides it into two bays, with a third trending towards the north-east. From the discharge, at the south-east end, to its north-east inlet, the distance is about five miles, and its greatest breadth is about four miles. It is surrounded by broken ranges of rocky hills, from 200 to 400 feet high, the wide valleys between being characterized by low ridges of drift. Over one half of the forest has been destroyed by fire, and the remainder is chiefly small black spruce and larch, with a few Banksian pines and birches. Here the river divides into two branches of about equal volume. That flowing into the south-west bay is called the Kiche-wapistoakan River, while the one entering the north-west angle of the lake, is called the Attikopis River. The former flows from the south-west, where it rises some forty miles away from Lake Attikopi, in a number of small lakes whose discharges interlock streams flowing into the Peribonka and Outardes rivers, with the head-waters of the Manicuagan River. This stream was explored for twenty miles above its outlet, to where a small tributary passes into Lake Kitchewapistoakan, on the portage-route past the unnavigable portion of the Mouchalagan River. For this distance the stream flows in a channel about one hundred feet wide, generally with a sluggish current, except at short rapids which occur at frequent intervals. The channel is very crooked, and the banks seldom show solid rock, being for the most part composed of sand and generally low. The main direction of the stream is determined by sharp irregular ridges of sand, which bound its western side. These ridges are nearly continuous and where they are cut by the river, show the false-bedded structure of an esker, or deposit

Lake Attikopi.

South-west branch.

Great esker ridge.

formed by a river flowing in or under the ice-sheet. This great esker was traced for more than twenty-five miles beyond Lake Attikopi toward the north-east, while in the opposite direction, according to the Indians, it extends almost to Lake Pletipi on the Outardes River, or a total distance of nearly one hundred miles. It is a marked physical feature in its south-western half, where it traverses wide swamps, and is used as a highway by the Indians in their winter travel. On the east side of the river, the country is covered with low, drumlin ridges of coarse till.

Highest area of central Labrador.

From the above description, the general surface of the country surrounding the river will be seen to be low and nearly flat, and it is only broken by occasional isolated rocky hills that rise from 200 to 400 feet above the general level. According to the Indian guide, the upper, unexplored portion of the river preserves the same character, flowing nearly on the surface of a wide swampy plain broken only by the esker ridge and by a few low drumlins. This plain extends northwards about ten miles to the foot of a high range of barren hills that rises 500 to 1000 feet above its level, and constitutes the highest area of central Labrador, being about 2400 feet above sea-level, forming the watershed between the Big River of Hudson Bay and the rivers flowing into the St. Lawrence.

Attikopis Branch.

The Attikopis Branch flows from the north-east, where it takes its rise in Lake Attikopis, or Little Attikopi, some twenty miles from the larger lake. The smaller lake is less than three miles long, and is divided by two narrows; it is chiefly of importance on account of two portage-routes which join here. One, from the westward leads to Nichicun, the other to Summit Lake. The Attikopis River, below the lake, flows in crooked courses in a wide valley bounded by rounded, rocky, isolated hills on the east side and by the higher range of granite hills on the west. Two spurs of this range rise close to the river. The valley is broken by low boulder ridges, with extensive swamps and small lakes between them. This country is partly covered with small, stunted black spruce and a few larches, while the hills are almost wholly barren. The river-channel is very irregular and occupies the depressions between the drift ridges. It practically consists of narrow lakes, connected by short rapids, where the channel is lined with boulders. Before reaching Lake Attikopi, it passes through a lake three miles long and about one mile wide, below which a mile of rapids and strong current leads to the large lake. Little Attikopi Lake is fed by two large brooks, both of which head in the mountainous country westward of Summit Lake. The portage-route follows the the eastern stream, almost due east, for six miles by its winding channel, to a lake about two miles across, surrounded by high, rugged, barren hills. Above this lake the stream is too small for canoes, and portages are made along it between the three small lakes at its head; these portages are respectively one-half, two, and one mile long. The portage over the watershed, between this stream and one flowing into the main branch, is about a mile and a half long and passes over a ridge between high, rugged hills, which surround the route. These hills are semi-barren, and the country has a very rough, desolate character.

Four small ponds, connected by a little stream, lead into a larger lake, about four miles long, the discharge of which is navigable with canoes, and, in a mile and a half to the next lake, it is broken by several rapids. This lake is a mile long and empties by a short rapid into Spruce Mountain Lake, which is four miles across to its southern angle, where it discharges. A narrow bay runs up a deep valley to the northward, and the lake is filled with islands and surrounded by high hills. The discharge is characterized by heavy rapids for two miles, to where it enters Itomamis Lake.

Portage-route between Lake Attikopis and Nichicun.

The portage-route to Nichicun leaves Lake Attikopis by its western tributary, which is ascended for about one mile; then a portage of over a mile leads to a little lake that empties into the small river. From this little lake two portages of a mile and a half mile respectively, with a small pond between them, end in a narrow lake, one mile long, connected by a short portage with a larger irregular lake, nearly three miles long. The general direction of this portion of the route is almost due west, and is through a wide valley surrounded by barren, rocky hills, from 300 to 600 feet high. The only trees seen skirt the lakes or grow in the swamps, the remainder having been destroyed by fire, leaving exposed low hummocks of drift thickly strewn with boulders. A portage of a quarter of a mile crosses the watershed and ends in a small lake drained by a tributary of the Big River. The direction of the route now changes to nearly south-west, for nine miles, as it passes first through a lake two miles long, connected with the next by a river stretch of one mile, with three portages past rapids, followed by a lake for five miles and another river stretch of a mile, with several rapids. A change of direction next occurs to west-north-west for the next twenty-four miles, along which course the stream passes through seven small lakes, and is greatly augmented by the junction of small branches from the lakes that partly fill the surrounding valleys.

Route to Nichicun.

Between each lake there are heavy rapids, so that the large lake, called Naokokan, into which the river empties, is some 200 feet below the level of the lake at the watershed, or nearly 1800 feet above the sea. The country surrounding the river is rough, but the rocky hills near the valley die away to the south and west as Naokokan is approached. Recent fires have destroyed the greater part of the small stunted, black spruce and larch, which partly covered the lower lands.

Lake Naokokan.

Naokokan is a large, irregular lake, nearly covered with islands and deeply indented with bays. Its greatest length, of thirty miles, is from east to west, while its width appears to be nearly twenty miles. From an elevation of 300 feet, near the mouth of the river, the lake had the appearance of a wide plain covered with numerous small lakes, and it was found only on passing into the lake that these numerous small lakes were really connected by straits and passages. Three days were spent in examining the southern shore of the lake in search of its outlet, and in that time only one of the deep western bays was explored. Owing to unfavourable weather—heavy south-west gales, accompanied by rain and fog,—and failing supplies, the exploration was ended here, without the outlet being found and descended to Nichicun. It has since been learned that the outlet is somewhere near the north-east angle of the lake, and that along it the distance to Nichicun is not more than twenty-five miles.

A large branch was discovered, falling with heavy rapids into the south side of the lake. This is the main stream of the Nichicun River, and takes its rise in a number of small lakes to the south, along the northern slopes of the mountains forming the watershed between it and the Manicuagan, Outardes and Peribonka rivers. South and west of Lake Naokokan, there is a wide, flat plain, broken only by small isolated hills, and covered with innumerable lakes; to the north and north-east, the high mountains of the vicinity of Nichicun are seen with their rugged barren tops.

Portage-route used in Ascending the Mouchalagan River.

As previously stated, a portage-route leaves the west bank of the Mouchalagan River, about twenty-five miles above Mouchalagan Lake. A description of this route is intelligible only by reference to the map, as it follows a succession of portages joining little lakes and streams that lie in small valleys between the hills of the table-land, high above the level of the river-valley. The first portage is a mile and a quarter long. It leaves the river immediately above the mouth of a small stream and follows up its valley to a little lake on the table-land 620 feet above the river. There is a very marked change in the size and variety of forest trees between the ends of the portage. At the river there is a dense growth of medium-sized, black and white spruce, balsam fir, Banksian pine, larch, white birch and aspen, while, about the small lake above, only stunted black spruce and Banksian pine separated by open glades, are found together with a few larch about the swampy margin of the lake.

Crooked courses for two miles lead to the west end of the lake, whence a portage of half a mile, then a pond, followed by a portage of a mile, lead to a chain of very small lakes, on the head-waters of the stream, at a level 200 feet above that of the lower lake. Three small lakes joined by rapids follow, to a portage one-third of a mile long, through a swamp, ending in a narrow, crooked stream which is ascended about a mile and then left by another swampy portage half a mile long, crossing the watershed between tributaries of the Manicuagan and Outardes rivers at an elevation of 1680 feet above sea-level, or 770 feet above the river at the commencement of the portage-route. The country surrounding the route is rolling, being broken by short, isolated ridges of rounded hills, that rise from 100 to 400 feet above the water level. Wide valleys lie between the hills, covered either with small lakes or swamps, and with frequent low ridges of boulders rising above the level. The soil is scanty, and everywhere boulders and large angular fragments of rock are scattered in profusion, so that there is no difficulty in walking in any direction over the higher ground without stepping off these, while in the swamps the portage roads frequently lead along ridges of packed fragments, without any fine material between, and only partly covered with a deep coating of sphagnum, or white moss. The trees growing on this poor soil are small and stunted, and over ninety per cent are black spruce, with only a few groves of Banksian pine and small larch in the swamps.

Character of the country.

From the height-of-land portage, the route for five miles follows a small stream connecting four little lakes, with short portages between them, and so reaches Little Matonipi Lake, about four miles long and a mile and a half wide, studded with many small, rocky islands. A portage of a mile and a half leads from near the discharge, at the north-west corner of the lake, to the eastern bay of Matonipi Lake. This bay is about two miles long, and from its mouth a northern bay extends four miles to its head, where the portage-route leaves it. Another long bay extends southward several miles, with a small river flowing out of its head, to join the Outardes River some twenty miles below the outlet of Lake Pletipi. The lake averages a mile in width, and is surrounded by rocky hills that rise

Matonipi Lake.

in rounded outline from 200 to 500 feet, those on the west side being the highest. This western ridge is only a few miles across, and an old portage-route leads over it to Lake Pletipi, some fifteen miles away.

The direction of the portage-route to Lake Matonipi has been nearly due west. It now changes to north, and continues near that course until it reaches the south-west branch of the Attikopi River. The surface of the lake is 1640 feet above sea-level. The next lake at the upper end of the portage is two miles distant from the north end of Matonipi; it is about three-quarters of a mile across, and 270 feet above Matonipi.

From this lake another portage of two miles leads over a barren, rocky ridge thickly strewn with boulders, into a narrow gully filled with small ponds, connected by a brook which discharges into Lake Matonipi. The rise on this portage is 350 feet. The route continues up the gully, and passes in the next four miles through five ponds, with intervening portages, to the height-of-land between the waters of the Outardes River and a small branch of the Mouchalagan River, at a height of 2390 feet above sea-level, and one of the highest water summits of the Labrador peninsula.

Highest level.

The portage over the summit is more than a mile long, and passes between low, rounded, rocky hills, covered with blocks and boulders, and ends in a small swampy lake, out of which issues a stream too small to be descended by canoes.

Two miles of portage, over boulders and through swamp, lead to the junction of this stream with a somewhat larger one. The portage here crosses to the west bank, and for two miles and a half farther, follows down stream, on the summit of a narrow esker of stratified sand.

At the lower end of the portage, the stream is about twenty-five feet wide, but soon increases to fifty feet, below a small north branch, where it has a shallow channel, sandy bottom and sluggish current. This stream was followed for three miles and a half, and then left by a short portage to a pond, followed by another portage of half a mile to a small lake without any outlet. From this lake a three-mile portage leads northward to another pond connected with a small lake by a portage of half a mile. A similar portage leads from this to a larger lake, which is followed northward three miles to its end. This lake empties by another branch into the main river. The next three miles are occupied by five portages, which pass up a shallow valley, surrounded by drumlin hills of coarse drift, and containing five small ponds. The next lake is two and a quarter miles long, and is left by a half-mile portage, ending in a small lake-expansion of the discharge of that lake. The discharge is followed for a couple of miles, and then a small branch is ascended a short distance, to a portage of a quarter of a mile, past rapids, to a small lake above. Five portages connecting ponds occupy the next three miles; then a small stream is reached and descended for about one mile, after which a two-mile portage leads to a pond connected by a short portage with a lake nearly two miles long, from which a portage of a half-mile leads to Lake Kichewapistoakan on a small stream flowing into the south-west branch of the Attikopi River already described. This lake is of no great size, and is broken into deep irregular bays by low points of drift and rock. It is chiefly remarkable, on account of its possessing two discharges, both of which enter the valley of the main river within a short distance of each other. In the spring, when the Attikopi branch is in freshet, its water backs into the lake, and flows out by the second outlet, which at ordinary times is nearly dry.

South-west Branch, Attikopi River.

The country and timber from the watershed to this place is similar to that already described. The only difference being the increase of drift on the northern slope, in the form of till and sand or esker-like deposits. The only trees are black spruce along with a very few larch, and all are stunted and confined to the valleys.

GEOLOGY.

Source of information.

The following notes on the various geological formations of the Labrador Peninsula are the result of observations made along widely separated lines of exploration in that great territory, and the time given to the work was very limited. It will thus be understood that they afford only the means of making a rough estimation of the distribution and extent of the areas of the different rocks, with some general remarks on their relations, modes of occurrence and age, together with a more or less detailed statement of the various exposures of rock actually examined along the routes followed.

The descriptions of the different rocks are from observations made in the field, together with a microscopic examination of the hand specimens brought back. It is to be regretted that circumstances prevented more than a small number of microscopic sections being made. These have been examined by Mr. W. F. Ferrier and described in Appendix V.

Geological Formations.

Laurentian.

The term Laurentian is employed to designate the complex mass of highly crystalline Archæan rocks of which the greater part of the

Labrador Peninsula is composed. These do not differ in any essential particulars from those similarly designated in other parts of Canada. They consist chiefly of gneisses and schists, some of which are believed to be highly metamorphosed materials of clastic origin, while others are regarded as foliated eruptives. As it is not possible, except in limited areas, to separate these rocks on the map, they are necessarily treated together.

The rocks of clastic origin are in nearly all cases the most ancient. The age of the areas of irruptive rocks is not known definitely, but many of them are very ancient, as fragments from them are included in the conglomerates of the Huronian. Others closely resemble the basic irruptives found cutting the Cambrian strata, and possibly are newer than that bedded series. These basic irruptives are in turn cut by later intrusions of granite, so that if the former are post-Cambrian some of the latter may be high up in Palæozoic time. Where the age of these rocks can be determined by their intrusion into the bedded series of the Huronian or Cambrian, they have been separated from the rest of the complex, and the remainder grouped under the name Laurentian until more evidence is obtained as to their exact age. It may be taken for granted, however, that by far the greater portion of the irruptive rocks included in the Laurentian are extremely ancient, and that the areas of those supposed to be post-Cambrian are unimportant compared with the areas of rocks long antedating that formation.

Huronian.

Under the name Huronian are included several widely separated areas of clastic and volcanic rocks, together with many basic eruptives; these are represented by various schists, conglomerates, breccias, diorites and other rocks more or less interfolded with the Laurentian.

Cambrian.

The Cambrian rocks rest unconformably upon the Laurentian and Huronian, and are made up of bedded sandstones, argillites, shales and limestones, along with bedded traps and other basic intrusive or volcanic rocks. More detailed descriptions of the Huronian and Cambrian rocks are given under their respective headings.

Great lapse of time between Huronian and Cambrian.

The Laurentian and Huronian gneisses and schists are intensely folded. This folding took place long previous to the deposition of the sedimentary beds of Cambrian age; and a sufficiently long time had elapsed between the period of folding and the Cambrian submergence, to allow for great removal of material by denudation and for the main sculpturing of the peninsula. The Cambrian rocks are found flat-bedded in the valley of Hamilton Inlet, and extend fifty miles up the Hamilton River; they are also found resting almost undisturbed in the great basins of Mistassini and Michikamau lakes. These examples show that the chief physical features of the Labrador Peninsula due to erosion, existed previous to the deposition of the Cambrian, and the enormous lapse of time requisite for the formation of the Hamilton inlet and river-valley can hardly be conceived, if the denudation was not much greater than that under present conditions.

LAURENTIAN.

Area

The Laurentian rocks occupy more than nine-tenths of the area of the peninsula, the remainder being underlain by scattered areas of Huronian and Cambrian.

Direction of foliation.

Nearly all these rocks are more or less foliated, the general directions of the foliation being roughly as follows: On the lower East Main River, near the coast, the general direction is east-south-east; farther inland, along the river, it is about east-north-east; along the upper part of the river, it varies from east to south-east. Between the East Main River and Lake Kaniapiskau the direction of foliation varies from east to east-north-east. Along the Koksoak River, above Cambrian Lake, it is from east-south-east to south-east, while, along the lower part of the same river, it is from north to north-east, showing a considerable change in the direction of the line of pressure, which here seems to have acted from the eastward, while elsewhere it appears to have been from the southward. Along the lower Hamilton River, the strike is from east to north-east, and above the Grand Falls, along the main stream, it is the same; but northward, towards Lake Michikamau, it ranges from east-north-east to north, the direction here being parallel to the Atlantic coast. On the Attikonak branch, where there are several large areas of basic irruptives, the strikes are more divergent, and range from east to south-south-east. Along the Romaine River, they vary from east to east-north-east, or are roughly parallel to the direction of the Gulf of St. Lawrence.

Of course the directions of foliation given above are merely general ones, subject to many minor changes, especially in the neighbourhood of intrusive areas, of both acidic and basic crystalline rocks. In such cases, the older foliated rocks appear to bend round these masses, and are often greatly contorted, both on the strike and dip.

Fundamental Gneiss.

By far the greatest area of the peninsula is underlain by medium to coarse-textured hornblende-granite-gneiss, corresponding to the Fundamental Gneiss of Logan. This gneiss varies in colour from red to light-gray, a pink variety being most abundant. It is made up chiefly of orthoclase, abundant quartz, together with hornblende, and commonly mica. It nearly always has a gneissic foliation, and at times an augen structure, due to the orthoclase collecting in bead-like masses, between laminæ of hornblende and mica. Sometimes over large areas the foliation is obscure, and the rock then approaches a true hornblende-granite.

Between Lake St. John and Lake Mistassini, along the routes examined, gneissic rocks of the above kind occupy over nine-tenths of the area. Northward, from Lake Mistassini to the East Main River, with the exception of a few bands of mica-gneiss, these are the only rocks met with. Large areas are found inland from the east coast of Hudson Bay, along the Big, Great Whale and Clearwater rivers.* Along the East Main River, rocks of this kind are met with at intervals; they are most abundant along the upper parts of the river, where, in places, being unfoliated, they pass into hornblende-granite, and as such form the great area passed through, from the head of the river to Lake Kaniapiskau. On the Koksoak River, an area of mica-schist and gneiss extends from Lake Kaniapiskau to the first gorge, below which the hornblende-granites, more or less foliated, again appear in association with mica-granite-gneiss, and continue along the river until the gneisses pass under the Cambrian rocks. On the Lower Koksoak River, the hornblende-granite-gneiss is less abundant. The same kind of rock is met with on the George River, at Port Burwell, Nachvak and along Hamilton Inlet. On the lower Hamilton River, it is found along with mica-gneisses, the latter being most abundant. Above the Grand Falls, hornblende-granite is the principal rock seen along the routes travelled, in the country stretching from Lake Michikamau on the north to the Gulf of St. Lawrence.

Differences in age.

From field study, the hornblende-granites do not appear to be all of the same age, some of the areas having an older and more altered look than others. The exact difference cannot be explained, but is quite noticeable when the areas are traversed. To one of these newer-looking masses, large dykes or veins of pegmatite were directly traced. These dykes were found cutting the rocks of Huronian age on the East Main River.

Pegmatite veins.

Pegmatite dykes or veins are very numerous everywhere in the Archæan rocks of the peninsula. They are found cutting the Huronian schists and basic eruptives, the anorthosite areas, the mica-gneisses, as well as the hornblende-granites, to which they appear to be genetically related. The most abundant mineral of these veins is orthoclase in coarsely crystalline masses, quartz in irregular crystalline lumps is next

*Annual Report, Geol. Surv. Can., vol. III. (N.S.), part J.

in abundance and hornblende is nearly always present, together with mica (biotite or muscovite) often in large plates, but usually much bent and twisted. Black tourmaline and red garnet are often found, the latter being most abundant. The colour of the orthoclase varies from red to white, and depends on the colour of the granite or granitite area, from which the pegmatite is derived. The width and direction of these veins are not nearly so constant as those of the basic dykes found throughout the region. They are often lenticular, and appear to have been injected into fractures and fissures, filling even very small cracks. Some of the veins are of great size, like those met with above the Great Bend of the East Main River, where the pegmatite is often more abundant than the mica-gneiss and schists constituting the original country-rock. The larger veins often hold angular fragments of the well foliated gneiss and schists, and some of these fragments are of great size. Although differing in appearance from the basic dykes, it is believed that these veins of pegmatite, from their character above described. and from the fact of their cutting all varieties of rocks of the Archæan, must be of irruptive origin, as has been clearly shown to be the case with similar veins met with in Sweden, and ably described by Prof. W. C. Brögger,* who believes that the pegmatite veins were formed during the later stages of irruption of the granite, when the main mass was in part solidified, and that the veins cutting the surrounding rocks were injected in a molten state; also that the materials of the veins were not deposited from highly heated aqueous solutions.

Grenville Series.

The rocks next in importance as regards area, are the mica-gneisses and mica-schists, that occur in wide persistent bands throughout the Labrador peninsula, and are taken to be the representatives of the Grenville Series of Logan, lately so well described by Dr. F. Adams.†

Mica-gneiss greatly predominates over all the other members of this group, and it varies from coarse-grained, well crystallized gneiss, through all gradations of texture and composition to mica-schist. Pink or white orthoclase, quartz and mica (generally biotite) are always present, and hornblende is often found in small quantities. Garnetiferous bands are frequently met with, especially in the great areas along the Manicuagan River. The gneisses are usually very quartzose, and in many places shade into an impure, garnetiferous quartzite. All are well foliated or stratified, and in many places the dip of the foliation approaches the horizontal, giving the rocks the appearance of flat-bedded, altered clastic rocks. In many places these gneisses and schists are associated with bands of crystalline limestone. On the upper

* Can. Rec. Science, vol. VI, No. 1-2. "On the formation of Pegmatite Veins."
†Am. Journ. Sci., vol. L., July, 1895.

Crystalline limestone.

Manicuagan River, the limestones are extensively developed and are found in thick beds, always associated with a rusty-weathering mica-gneiss that contains both pyrites and graphite. Several smaller bands of limestone occur along the rivers north of Lake St. John, in conjunction with the garnetiferous mica-gneiss, also in the valley of the Hamilton River, below Lake Winokapau, and at Lake Attikonak. On the East Main River, a couple of small bands were noted a few miles above its mouth, and along the coast of James Bay in the vicinity of that river. These limestones, when the bands are thin, are sometimes greatly broken and very irregular. They then often enclose broken masses of the surrounding gneiss, and apparently pass between different strata of the gneiss, so that they often resemble veins parallel to the bedding rather than true beds. In other places they closely follow the bedding or foliation of the adjoining gneiss, being quite persistent for considerable distances, and having all the characters of true beds.

Supposed bedded structure.

The well marked foliation of this series of gneisses and schists, the developement of garnet in most of them, together with the graphite in the beds adjoining the limestone, and the apparently great bedded masses of limestone and iron ore of the Manicuagan River, all point to a former clastic origin and bedded structure for this series; and in many places where the limestones, quartzites and iron-bearing gneisses are present, the lines of foliation appear to coincide with those of the bedding planes. An originally bedded structure would also account for the nearly horizontal position of the gneisses noted in many places. The association of altered hornblendic and chloritic schists, probably of volcanic origin, and bearing a close resemblance to similar rocks of Huronian age, with the mica-schists and garnet-mica-gneisses of this series, as seen along the upper gorge of the Mouchalagan River, points to a connection between the Grenville series of the Laurentian and the Huronian.

Associated eruptives.

Along with the mica-gneisses occur bands of hornblende-schist, often broken and at times stretched out into lenticular masses. From the field relations, these hornblende-schists in most cases appear to have been ancient basic dykes, which were folded up, broken, and contorted by the same pressure that produced the changes in the surrounding gneisses. This is well shown at the whirlpool at the Great Bend of the East Main River, where a dyke of hornblende-schist is seen inclosing a large mass of the gneiss. Where it runs transverse to the foliation of the gneiss, the schistose structure of the dyke remains parallel to that of the gneiss, or transverse to the walls of the dyke.

The minor areas of acidic irruptive rocks include some of syenite, generally with a little quartz; others of quartz-porphyry and granite, holding considerable plagioclase. The basic irruptives are represented by great areas of anorthosite, gabbro, diabase and diorite. The anorthosite areas are the largest and most common. They occur on both sides of Lake Michikamau, along Lake Ossokmanuan, about the south end of Lake Attikonak, on the upper part of the Romaine River, as well as along the portage-route between that stream and the St. John River, and extending down the last-named river to within a few miles of the Gulf of St. Lawrence. This last-mentioned area probably extends westward to the Moisie River, and forms part of the great mass of this rock found by H. Y. Hind* on that stream. A probable continuation of this area was also met with along the Manicuagan River, where it has a breadth of more than twenty-five miles, its southern limit being within twenty-five miles of the coast. Anorthosite areas.

Along the Atlantic coast, anorthosite is found in a number of places southward from Nain to Hamilton Inlet, and areas are said to occur on Grand Lake of the Northwest River, in the Mealy Mountains, south of Hamilton Inlet, and, according to A. S. Packard,† at Tub Island, within a hundred miles of the Strait of Belle Isle.

The anorthosite is a variety of gabbro, made up of labradorite holding isolated masses of hypersthene or rhombic pyroxene, ilmenite and mica. In texture it varies from exceedingly coarse, with crystalline faces sometimes nine by six inches, to a fine-grained saccharoidal form. The colour is generally a shade of violet, and is mostly dark, especially in the coarser varieties, which sometimes have a green tinge. The fine-grained granular variety is always light-coloured, varying from white to light shades of pink and violet. Along the north shore of Michikamau Lake, where the rock is very coarse-grained, many of the crystal faces show a beautiful irridescent play of colour, in shades of green, blue and bronze-yellow. The crystals having this property are not confined to veins or dykes in the rock, but pervade the whole mass, and were seen for more than ten miles along the shore of the lake. This property of the rock was seen to a less degree in large crystalline surfaces included in the granular variety on the upper Romaine River. Precious anorthosite.

The coarse crystallization of these rocks is probably due to the slow cooling of the enormous masses in which they are found. Dr. F. D. Adams,‡ from his microscopic study of the Morin and Saguenay anorthosites, has shown that the light-coloured varieties were originally coarse in texture and dark in colour, like the massive areas, and that their present structure and colour was induced by pressure. The light-

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*Explorations in Labrador, vol. I.

†Coast of Labrador.

‡Canadian Record of Science, vol. VI., p. 277, Jan, 1895.

coloured anorthosite is often found foliated, and passes into a gneiss, from the presence of mica in small scales, or from small grains of ilmenite arranged in bands. Dark red garnets were found in some of the gneissic areas. As before stated, large, isolated, crystalline masses are found in the granular rock, being evidently uncrushed parts of the former mass. Near the head of Lake Attikonak, a contact between the massive rock and a gneissic granular variety was seen. The two rocks are here found separated by a sharp, distinct fault-line that runs nearly at right-angles to the direction of foliation, or parallel to the line of pressure. On one side of the fault the rock is coarse-grained, dark-violet anorthosite, without any signs of gneissic structure or pressure disturbance ; on the other, the rock is whitish, with a granular texture, resembling coarse loaf sugar, and in places it has a distinct banded structure, from the presence of small plates of mica, grains of ilmenite and some red garnet. It would appear that a strong force from a south-eastern direction had acted upon this area of anorthosite, causing first the fault, and, subsequently, the crushing to the gneissic mass.

Contact of coarse and fine anorthosite.

The light-coloured, granular anorthosites predominate on the upper Romaine River and in the great area between that stream and the St. John River, showing apparently that the crushing of the anorthosite areas was greater to the south, along the St. Lawrence coast, than in the interior, where the crushed rock is very rare. It is not found about Lake Michikamau.

Associated minerals.

The anorthosite areas of the interior generally weather to a dark brown, while towards the coast the decomposed surface is usually white. The hypersthene found in these rocks occurs generally in large crystalline masses, often a foot in diameter, exhibiting, at times, zig-zag structure in section, due probably to crushing. It is of a brown colour and generally has a metallic lustre. The ilmenite, or titanic iron ore, is mostly found in irregular, crystalline masses, varying from small grains to lumps several tons in weight. Sometimes the ilmenite is in small crystals scattered through the mass of the labradorite. Mica is not common, except in the foliated varieties, where it occurs in small plates, and much more rarely in the massive rock. In the area about Ossokmanuan Lake especially, the labradorite is considerably decomposed, into large, irregular patches of dark green saussurite. On the south side of Lake Michikamau, the anorthosite passes into a dark green gabbro along the east side of the mass.

Diabase.

Gabbro and diabase, having to all appearance the same or a similar origin to the great anorthosite areas, are met with along the Hamilton River, especially in the neighbourhood of the Grand Falls, where these rocks form all the higher hills about the portage-route. These areas are small, and are separated from one another by belts of orthoclase gneiss. The texture is generally moderately coarse, but at times it is fine-grained. The colour is greenish to black, while the weathered surface is commonly brown. These masses of gabbro and diabase closely resemble those found cutting the Cambrian rocks of the upper Hamilton River, and may be of the same age, as they appear to have been intruded into the old gneisses after the latter had become foliated. The great diabase dykes found everywhere throughout the peninsula, where they cut rocks of all ages, up to and including the Cambrian, are directly associated with these diabase or gabbro masses in the district, and probably represent the latest great irruption of igneous matter to be found in the Archæan of Labrador.

Diorites are not commonly found along the routes traversed, and the small areas noted may be in part, at least, only altered diabase. Sometimes they shade into quartz-diorite, which, with the basic granites above referred to, form several comparatively small areas on the Chamouchouan River, and along the Koksoak and Lower Hamilton rivers. Diorite.

Details of Rock Exposures along Routes.

Chamouchouan River.

The rocks along the Chamouchouan River, from its mouth at Lake St. John, to its head-waters, have been described by Jas. Richardson,* who examined the river and the route beyond to Lake Mistassini, in 1870, and it only remains to add such information as has been obtained later, from a closer examination of certain areas along these routes and at other places not visited by Richardson. Before doing so, it is right that mention should be made of the careful work done by that observer, and it is only our more extended knowledge of the country that enables changes to be made in a few of his determinations. J. Richardson.

From the first rapid to the quiet stretch of water above the Little Bear Portage, the rocks show frequently from below the overlying, stratified drift along the river-valley. They are fine to coarse-grained red and gray mica-gneiss and mica-hornblende-gneiss, accompanied by thin bands of hornblende-schist. Strike N. to N.E. Little Bear Portage.

. Can., 1870-71.

Thirty-five miles above its mouth, the river enters a narrow valley between steep rocky walls that afford almost continuous rock-exposure to the Chaudière Falls, twenty-one miles farther up stream. At the foot of the valley, on the west side of the river, dark red and gray mica-gneiss occurs, along with coarser, grayish-green hornblende-gneiss, holding small grains of magnetite. Dip E. < 60°-70°. From here to the mouth of the Mouchipon River, seven miles above, the rocks are mostly a coarse-grained, dark-greenish, basic gneiss, composed of dark, grayish-green orthoclase and plagioclase, dark-green hornblende and quartz. The rock in mass greatly resembles the crushed basic granite, microscopically examined by Mr. Ferrier,* that occurs along the upper Jacques Cartier River, in Portneuf County, and other similar areas met with throughout the region between the St. Lawrence and Lake St. John. Along with these basic rocks are bands and veins of coarse, red pegmatite, and also bands of finer-grained, gray and pink mica-gneiss, and fine-grained, flesh-coloured hornblende-gneiss, the hornblende of which is light-green and much decomposed.

Basic granite

From the Mouchipon River to the foot of the White Spruce Rapid, some seven miles above, the rocks seen are all dark-greenish basic granite, containing much dark plagioclase and specks of pyrites; they are not well foliated, and have the appearance of an intrusive mass. Large veins of red and white pegmatite are commonly seen penetrating the granite.

At the foot of the White Spruce Rapid, there is an exposure of medium-grained, pink mica-hornblende-gneiss. Dip S. < 45°. At the Chaudière Falls, the rocks are chiefly fine-grained, thin-banded, gray and pink mica-gneiss and mica-hornblende-gneiss, interbanded with thin bands of dark greenish-gray mica-diorite-gneiss, that often approaches a hornblende-schist. Average strike N. These rocks are much contorted and are penetrated by large veins of pegmatite that hold much dark green hornblende. Richardson found, below the falls, a thin band of pink crystalline limestone, but it was not seen by the writer, being probably covered by the high water.

Chaudière Falls.

At the Little Chaudière Fall, the rocks are the same, only the amount of basic gneiss is less. Another thin bed of limestone occurs in the gneiss just above the last-mentioned fall. Mica-gneiss and mica-hornblende-gneisses are met with along the main stream to its junction with the Chief River. At the sixty-sixth mile, thin bands of gray crystalline limestone, holding scales of mica, are interbanded with coarse mica-gneiss and dark mica-schists. These bands are seen almost

Crystalline limestone.

*Annual Report, Geol. Surv. Can., vol. V. (N. S.), p. 75 L.

continuously along the west bank of the river for the next two miles, to the mouth of Pike River. The thin bands of limestone and associated gneiss are not above fifty feet thick, and none of the limestone bands exceed a foot in thickness. Above, at the bend of the river, the beds appear to thicken, and may be twice the width mentioned. Dip N. 75 E. $<40°$. Limestone is not again seen in the Laurentian rocks northward up to Lake Mistassini.

No rock in place is seen along the Chief River from the forks to the first chute, about fifteen miles up. Here the river passes over a ledge of dark-gray medium-grained hornblende-gneiss, composed chiefly of black hornblende, with white orthoclase and little quartz. Dark red garnets are generally present, at times in crushed crystals an inch in diameter. The gneiss is cut by a number of pink pegmatite veins. Dip S. 40° E $<60°$. These gneisses continue along the river-banks for more than half a mile, to the foot of the next chute. They are here interbanded with fine-grained, highly felspathic, pink hornblende-gneiss. Chief River.

At the head of the second chute, medium fine-grained, light-gray hornblende-mica-gneiss is seen, along with finer bands of a pinkish tinge. Dip S. 40° E. $<50°$. Above this to the fourth portage, eight miles farther up, frequent exposures of hornblende gneiss and hornblende-mica-gneiss occur along the river. The rocks are everywhere evenly bedded, and are not contorted along the strike. At the fourth portage the strike is S. 45° E. $<$ 45°-60°.

The same rocks are seen, at long intervals, in the next eight miles, to the mouth of the Sapin-crôche River. The banks of this stream are low, and are formed of drift for eleven miles above its junction with the Chief River, and no rock is seen in place until the long portage past a heavy rapid is reached, where light-gray, highly felspathic, medium to fine-grained hornblende-mica-gneiss occurs. Strike N. 45° E. Sapin-crôche River.

These light-gray hornblende-gneisses are seen at intervals, everywhere along the route, up to the head of the river. In places about Canoe and File-axe lakes they have a granitic structure, and then resemble a true hornblende-granite. Small garnets are often present in these rocks. Beyond the watershed, they again show foliation and at times change to a hornblende-schist. Ten miles up the Perch River, which flows into the south-west bay of Lake Mistassini, these schistose gneisses are seen, overlain by the Cambrian limestones of Mistassini without the intervention of the Huronian rocks found to the south-west of Lake Mistassini, and which, if they extend in a north-west direction, pass under and are concealed by the newer limestones about the lake.

Chegobich Branch.

Chegobich River.

The Chegobich River, which joins the Chamouchouan a short distance above the Chaudière Falls, flows from the north-west, where it heads in Chegobich Lake, close to Lake Ashoupmouchouan. Owing to its more direct course and fewer rapids, it is used as a portage-route to the last-named lake, in the spring time, when its volume is sufficient to float loaded canoes.

The Laurentian gneisses are exposed along its course at frequent intervals, and as the general strike of the rocks is nearly north-and-south, the stream crosses it diagonally. For the first nine miles from the mouth of this branch, the rocks met with are gray and pink mica-gneiss, that varies from medium-coarse to fine-textured; the pink-coloured variety predominates, and all are very felspathic.

Along the next twelve miles, to Lake Chegobich, these mica-gneisses are interbanded with medium-grained, gray mica-hornblende-gneiss, together with a few bands of white quartzite, holding garnets, and also bands of rusty-weathering mica-gneiss.

On the sides of Chegobich Mountain, near the discharge of the lake, the yellowish-pink mica bands predominate, along with a few gray bands; their texture varies from medium to fine-grained, and orthoclase is the predominant constituent, with mica and quartz, and in some bands hornblende. Pegmatite veins are common here as well as lower down the river. The shores of the lake are low, and the country between it and Ashoupmouchouan Lake is swampy, without any rock in place.

Lake Nikaubau.

From Lake Ashoupmouchouan to the head of the river, exposures of rock are met with but rarely, and where seen they were made up of red and gray mica-gneiss, along with bands of dark hornblende-gneiss and hornblende-mica-gneiss. On an island in Lake Nikaubau the gneisses are cut by a dyke over fifteen feet wide, of dark brownish-green diabase of fine texture, containing a quantity of brown, translucent mineral.

Lake Mistassini to East Main River.

Hornblende-granite-gneiss.

The rocks underlying the country from the north-west shore of Lake Mistassini almost to the East Main River, are all referable to the Laurentian. From the numerous exposures examined, it would appear that hornblende-mica-gneisses and hornblende-gneisses, alone, characterize this area, with only one large dyke of diabase cutting them. These gneisses are often only obscurely foliated and approach closely to the structure of hornblende-granites. To all appearance this great area is, like those between Lake Nichicun and Lake Kaniapiscau, along the Koksoak River and also on the Big and Great Whale rivers, referable in type to the fundamental gneiss of Logan's Trembling Mountain section.

Leaving Lake Mistassini, coarse to medium-grained, pink and red, hornblende-mica-gneiss is met with in several places along the low banks and small islands of the northern channel of the Rupert River, before the first portage is reached. In these gneisses hornblende appears to be always more plentiful than mica. Scattered throughout the mass of the gneiss, are lenticular patches of dark hornblende-schists and often finer bands of hornblende-schists and hornblende-mica-schists. General strike N. 50° W. The same kinds of rock are constantly met with to the portage past the fall, where the river enters Pinched-neck Lake. Below the portage, great angular masses of dark-green amphibolite are seen in which the hornblende is arranged in large sheaf-like masses of long, narrow, secondary crystals, some of the masses being six inches in diameter. On the islands of Pinched-neck Lake, the exposures are small and few, and show pink granite-gneiss, with inclusions and broken bands of dark hornblende-schist, much contorted. Strike N. 10° E. to N. 40° E. Amphibolite

At the narrows leading from Lake No. 7 to Lake No. 8 of the portage-route between the Rupert and East Main rivers, there is exposed a portion of a large diabase dyke. The rock is of a dark greenish-gray colour with more or less rounded, yellowish-green masses of plagioclase. The size and direction of the dyke is unknown, as its contacts with the surrounding gneisses are concealed. This rock has been microscopically examined by Mr. A. E. Barlow, and his description of it is to be found in Appendix V. The few exposures along the portage-route to the East Main River, show that the underlying rock is all hornblende-mica-gneiss, with its associated bands of hornblende-schist, as far as the outlet of Clearwater Lake. Only two or three small rock-outcrops are seen along the discharge of this lake, and they are all fine to medium-grained mica-gneiss like that found along the East Main River in the immediate vicinity of the mouth of that stream. General strike N. 10° E. Huronite dyke.

Lower East Main River.

The land surrounding the mouth of the East Main River is low, and the river-banks consist of stratified clay. On Governor Island, at the entrance of the river, there is a large exposure of light-gray, medium- Mouth of East Main River.

grained granite-gneiss, cut by masses and dykes of a dark-red hornblende-granite. The gray gneiss is much contorted and has a general strike of N. 80° E.

The next exposure seen along the river, is on a small island close to the south shore, two miles above the Hudson's Bay post, where coarse, gray mica-gneiss appears, holding patches and veins of fine-grained, pink hornblende-granite. Strike N. 75° E. No Laurentian rocks are again met with along the river for 125 miles, or to within twenty miles of the lower end of the Great Bend. The river, in this part of its length, follows closely the strike of a band or bands of Huronian rocks, described under their proper heading.

Contact of Laurentian and Huronian below the Great Bend.

The gneiss below the Great Bend, varies from fine to medium texture, and is either pink or light-gray in colour. It is very felspathic, and as a rule holds little quartz. Hornblende and mica are present, the former being always most abundant. In places, the foliation is indistinct, and the gneiss then approaches a hornblende-granite. The general strike varies from N. 70° E. to N. 85° E. The foliation of this mass apparently took place previous to the deposition of the Huronian schists, as blocks of the gneiss are inclosed in these, with the gneissic structure sometimes transverse to the structure of the schists. At the lower end of the Great Bend, these hornblende-gneisses are associated with small areas of light-gray rock, composed chiefly of white orthoclase, with crystalline grains of opalescent quartz, and scattered porphyritic crystals of orthoclase. This appears to be an intrusion of quartz-porphyry into the granites. Along the next two miles, the granite-gneisses are mixed up with diorites and hornblende and chlorite-schists, that are taken to represent intrusive masses of Huronian age, as they clearly cut the gneisses. These gradually thin out, and only a few narrow bands of dark-green hornblende-schist are seen penetrating the gneiss for a mile above, to the chutes.

Contact at the Great Bend.

The river above the chutes flows in a shallow channel between rocky banks overlain with drift. For twenty-one miles, only Laurentian gneisses are met with, until they are again cut off by an area of basic irruptives. The gneisses are light-gray and pink in colour. For the lower half of the distance, a coarse-grained hornblende-granite predominates. It often has an augen structure, but in other places is almost unfoliated, and then holds large porphyritic crystals of orthoclase. Segregations of hornblende are common, often large, and always lenticular in shape. The rock has the appearance of an irruptive mass. Associated with it, are bands of finer-grained mica-gneiss, with a more marked foliation. Along the upper half of the distance, the hornblende-gneiss is much finer and very felspathic, while the accompanying mica-

Augen gneiss.

gneiss is more abundant. The strike throughout is very regular and is almost directly E. and W.

The basic intrusives first appear about two miles below the Broken-paddle River. From here to the mouth of that stream, the main river passes close to the contact between the Laurentian gneisses and the Huronian rocks. Contacts were seen in several places, and at all of them the Huronian dykes were undoubtedly intruded into the older Laurentian gneisses. Contact of Laurentian and Huronian at Broken-paddle River.

Gneisses are not again seen along the river for seventeen miles ; they re-appear five miles above the last exposure of Huronian, the rocks in the interval being concealed beneath the drift.

For the succeeding twenty-five miles, to beyond the next sharp northern bend of the river, the rock is chiefly a mica-gneiss. It varies from a mica-schist to a medium-grained gneiss, and its general colour changes with that of the constituent minerals, from dark-gray to light-gray or pink. The rocks have a general dip to the northward < 15°–70°. They are cut by numerous dykes or veins of coarse pegmatite, either white or light-pink in colour. These dykes are very irregular in size, and along their direction pinch out and come in again, so that they have a lenticular appearance in most places. They clearly cut the gneisses, and often enclose angular masses of the gneiss, which when so situated is generally schistose. Farther up the river the pegmatite becomes more abundant, and at the upper end of this course greatly exceeds the gneiss and forms high rocky walls showing large enclosed fragments of the schist. The pegmatite is composed chiefly of coarsely crystalline orthoclase, with large masses of quartz and little mica or hornblende. Large dark-red garnets are not uncommonly scattered through the mass, and in some places large crystals of black tourmaline are seen. Pegmatite veins.

For the next ten miles, to the lake portages, the same rocks are seen, along with a medium-grained red hornblende-mica-gneiss. Here the pegmatite dykes are not so large and are less abundant. The red hornblende-mica-gneiss is interbanded with the gray mica-gneisses, but their relations to one another could not be studied. The general dip is N. 10 E. < 15°–80°.

At the upper end of Prosper Gorge, the rock is chiefly a medium- to coarse-grained, pink hornblende-mica-gneiss, in which the hornblende predominates over the mica. It holds a few fine-grained dark-gray schistose bands. Dip N. 35 E. < 15°. This rock has the appearance of an irruptive and is associated with a gray and more micaceous gneiss, holding grains of magnetite. Prosper Gorge.

A mile above the portage, there is a large exposure of coarse, red, highly felspathic gneiss, containing small quantities of light-green decomposed hornblende. Dip N. 50° E. < 30°.

Medium- to fine-grained hornblende-mica-gneiss, along with thin bands of gray mica-gneiss, outcrop at intervals for the next six miles, to a small chute. Above the chute, and from there to the foot of Ross Gorge, the gneisses become darker and more schistose, and are cut by dykes of red pegmatite that carry much hornblende. The schists are mica-hornblendic and micaceous. The strike of these rocks along here shows that there has been a great bend in the foliation, which assumes a direction N. 60° W. Three miles above the chute, there is a large dyke of coarse diabase, holding much pyrites, and running N. 30° W., or diagonally across the strike of the foliated rocks. The composition of this dyke is similar to the newer dykes previously described as of post-Huronian age.

Large diabase dyke.

The few exposures met with on the portage past Ross Gorge, show pink mica-hornblende-gneiss, full of small red garnets, and cut by coarse pink pegmatite.

Between the head of Ross Gorge and Lake Nesaskauso, there is only one small exposure of pink mica-gneiss. About this lake, the rock is to all appearance an altered, intrusive hornblende-granite. It is generally red in colour and coarse-grained, with frequent bands of dark mica-hornblende-schists. These bands are long lenticular masses lying parallel to the foliation, and when followed along the strike are soon found to pinch out.

From the lake to the foot of Grand Island, the rocks along the river are mostly light-coloured mica-gneiss, with a few bands of mica-hornblende-schist, both of which are cut by large masses of white and pink pegmatite. Garnets are common both in the pegmatites and gneisses. The strike of the foliation here is again nearly parallel to that below Prosper Gorge, or N. 80° E.

The exposures along the northern channel past the Grand Island, are few, and everywhere show coarse, light-pink or white pegmatite, in great dykes, cutting mica-schists and enclosing broken bands of mica schists and mica-hornblende-schists. The pegmatites are much more plentiful than the foliated rocks. In the pegmatites garnet is common, in large dark-red or black crystals, and dark-green hornblende and greenish muscovite are frequently met with, along with much quartz. Two miles above the foot of the island, there is a large mass of dark-green amphibolite, which is probably the decomposition-product of a diorite dyke ; its contact with the gneisses is concealed.

The rock is made up of dark-green hornblende arranged in stellar masses of needle-like secondary crystals. These masses vary from half an inch to one inch in diameter, and give to the rock a beautiful spotted appearance on its smooth glaciated surfaces. Large blocks of the same rock are found at the rapid on the south channel, about a mile and a half above the foot of the island, and probably represent an extension of the dyke in this direction. Diorite dyke.

About Tide Lake, along the south channel, the pegmatite dykes are fewer and smaller, and, in consequence, more of the foliated gneisses are seen. These are mostly mica-gneisses, that vary in texture from medium to fine, and in colour from light-gray to light-red. Along with these are a few bands of red hornblende-mica-gneiss. Above Tide Lake no rock is seen along the south channel until within two miles of the head of Grand Island, where a low exposure of light-green serpentine appears on the north side. The mass seen is about thirty feet wide, and is bounded on the east side by green chlorite schists, containing small blotches of white plagioclase. The serpentine contains pearly hydromica in radiating flakes, and whitish hornblende in secondary radiating crystals. It is probably a highly decomposed dyke cutting the pegmatite and mica-gneisses that are seen a short distance above. Serpentine.

From the head of Grand Island to the end of the survey of 1892, a distance of about ten miles, the rocks are all mica-gneisses cut by pegmatite dykes. The gneiss varies from a fine dark-gray mica-schist to a medium-grained light-gray gneiss. The pegmatite is always white, and as the river is ascended the dykes gradually die out.

Upper East Main River.

At the starting point of the survey of 1893, the rocks are medium to fine-grained, dark greenish-gray mica-schist, and dark-gray mica-gneiss, cut by large, irregular masses of white or light-pink pegmatite. Both pegmatite and gneisses are cut by small dykes of fine-grained, compact, dark-green diabase. In the next three miles, small exposures of fine-grained, light-gray, highly felspathic granite-gneiss, cut by pegmatite, are seen on both banks of the river. Strike N. 80° E. with northerly dip. Mica-gneisses.

At the lower end of the large island immediately above the mouth of the Kawatstakau River, the rock is finely banded gray and pink granite-gneiss, cut by pegmatite. Strike N. 65° W. Fine-grained, dark-gray, highly micaceous gneiss, associated with coarse white pegmatite, is seen at the small rapid one mile and a half above the last. From here to Sunday Portage very few exposures are seen, and all consist of gray and pink mica-gneiss along with pegmatite. Some of the gneissic bands are garnetiferous. Strike N. 80° W.

At the foot of the next rapid, two miles above, there are exposures of dark-gray granite-gneiss, cut by gray pegmatite. Half a mile above this rapid, low cliffs occupy both shores for a short distance, the rock being chiefly coarse, white pegmatite, with broken bands of fine-grained, dark-gray hornblende-granite-gneiss, often weathering greenish from the presence of decomposed hornblende. Some of the bands are highly hornblendic. Strike N. 80° W. Two other exposures occur on the south side, before the Pond Portage, both showing the same dark greenish-gray hornblende-granite-gneiss, cut by pegmatite, and at the upper exposure the rock is nearly horizontal. Mica is the principal constituent, the hornblende forming but a small percentage of the mass. At the foot of Pond Portage, similar schistose gneisses, cut by pink pegmatite, are seen, dipping N. 5° W. < 15°; while at the small lake on the portage, these are found interbanded with coarser highly felspathic, light-gray granite-gneiss, both cut by pegmatite. Strike S. 85° E. At the short rapid on the north-west bend, three miles above the Pond Portage, the rock is mostly a dark greenish-gray mica-schist, with coarser, more felspathic bands, and pegmatite. Dip N. 80° W. < 25. A mile and a half above, on the west side, is an exposure of medium-grained, light-gray granite-gneiss, cut by pegmatite; while half a mile farther on the same side, there is a sharp rocky point where dark, greenish gray mica-schist is interbanded with lighter-gray granite-gneiss, and is cut by a yellow-weathering, red pegmatite. Strike N. 10° W.

Pond Portage.

At the islands, a mile and a half above the north-west bend, the rock is a dark-red, highly quartzose granite-gneiss, holding little hornblende. One mile above, and on the south side, light-gray, medium-grained granite-gneiss is seen, with a few bands of dark mica-schist. Strike N. 80° W. No exposures now occur along the river for over three miles, until the foot of the high hill is reached on the north side. There the rock is a coarse pink pegmatite, at times a coarse syenite, and holds a few broken bands of mica-schist. The mountain mass appears to be formed of coarse pink and red hornblende-granite. On the opposite shore are seen dark greenish-gray mica-hornblende-schists.

Hornblende-granite.

A quarter of a mile above, where the river bends abruptly south, away from the mountain, the rock is a coarse, red hornblende-granite, and is followed a mile and a half beyond by medium-coarse flesh-red hornblende-granite, with a light-green serpentine, or chloritic mineral, filling small cracks and veins in it. The hornblende is dark-green in colour. The quartz, at times, is stained dark-red, and small red garnets are also present. The granite often shows signs of foliation, and so becomes a hornblende-granite-gneiss.

At Sharp Rock Portage a continuous section of schists is exposed for a quarter of a mile. At the lower end of the portage, dark-gray mica-schists are interbedded with more felspathic, fine-grained, light-gray gneisses, and are conformably followed by a considerable thickness of dark hornblendic and altered hornblende-schists, on edge, their strike being S. 85° W., and very regular, except where they fold around lenticular masses of dark-green hornblende. The schists are arranged in narrow, dark-green, light-green, white and brown bands. The white bands are highly felspathic, while the colour of the brown ones is due to the decomposition of pyrites, which mineral, along with quartz, is also found in small irregular veins, cutting the schists. A few small bands of white pegmatite also cut the schists. These schists closely resemble the hornblende-schists associated with irruptive rocks, found in several large areas along the lower parts of the river, and are supposed to be of the same or Huronian age. The pegmatites and the masses of hornblende-granite from which they are derived, must be post-Huronian, as they distinctly cut these rocks.

Huronian schists at Sharp Rock Portage.

One mile above the portage, on the south side of the river, bands of greenish-gray mica-schists and mica-hornblende-schists are seen, interfoliated with thin felspathic bands of a light-gray colour, and the whole is cut by pegmatite. Strike S. 85° W.

A mile above the last, on the same side, is a large exposure of coarse white pegmatite. At the chute, a short distance farther up along the north side, the dark-gray schists are much contorted and broken by masses of pegmatite.

At and below the islands at the narrows, two miles above the chute, the dark greenish-gray mica-schists and mica-hornblende-schists are partly interfoliated with a medium-grained, pink, highly quartzose hornblende-gneiss, which appears to have broken up between the bedding planes of the schists, and in places forms great masses wholly displacing them. The granite has in many places a porphyritic appearance, due to large perfect crystals of orthoclase, generally parallel to the plane of foliation. At the upper end of the island the schists are found only in broken bands and fragments imbedded in the granite. On the south shore, opposite the head of the island, the schists are, however, well developed, and only a little granite is seen.

Upper contact.

Three-quarters of a mile beyond, and for nearly half a mile along the north shore, red hornblende-granite and gneiss are found holding a few broken bands of mica-schists and hornblende-mica-schists. The same rocks are again seen coming out at the head of a small island half a mile above; dip N. 5° W. < 30°. At the foot of the hills, three-quarters of a mile farther up, on both sides, are hornblende-granites cutting mica-schist, interbanded with medium-grained, highly felspathic hornblende-granite-gneiss; dip N. 5° E. < 40°. For the next four miles there are three small exposures, all of medium-grained, pink hornblende-granite and gneiss.

Hornblende-granite.

At and below Mink Portage and at the chute immediately above, there are a few bands of mica-schist along with a great thickness of medium to coarse-grained, light-gray hornblende-granite, at times showing signs of foliation parallel to that of the schists. Dip N. 30° W. < 45°. Both schist and granite are cut by white pegmatite. From here to above the islands of Channel Portage, a distance of over four miles, on both sides of the river there are many exposures of medium-grained, light to dark-gray hornblende-granite-gneiss, associated with, and apparently cut by pink to red granite, also medium-coarse in texture. The granites are most abundant, and both rocks show frequently signs of foliation. Strike N. 50° E.

Diabase dyke.

For the next four miles upward, the river flows between low sandy banks, the rocks again appearing on the small islands in the rapid at the end of that distance, where part of a great diabase dyke is seen cutting a flesh-red, medium-grained hornblende-granite. The same dyke is probably seen on the north side, a quarter of a mile above the islands, where it cuts a medium-grained, pink hornblende-gneiss. Strike N. 60° E. The dyke is here thirty-five feet wide, and runs N. 20° W. In structure it is fine-grained, and it splits into sharp, angular fragments, along two principal cleavage-planes, arranged at an acute angle to one another. The colour is dark-green, and only a few blotches of dull, white felspar are coarser than the general texture.

Exposures of pink and red, medium to coarse hornblende-gneiss, are frequent along both banks of the river for the next two miles, and are followed by a great exposure of dark-greenish hornblende-schist, which forms the mass of a high hill on the south side. The hornblende-schist, towards the upper end of the exposure, takes up mica and gradually passes into a dark-green mica-hornblende-schist, closely resembling the rock met with along the river below the granites. It is also cut by white pegmatite.

Above this, for two miles, the shores are composed of till, and then again become rocky, forming an almost continuous exposure for the next two miles, with frequent exposures in the following ten miles. Red and pink hornblende-gneiss forms the mass of the rock, and often holds broken bands and lenticular patches of dark-green hornblende-schist. General strike N. 60° E. In places the bedding, or plane of fracture, is nearly horizontal. Some bands are composed largely of felspar, and are then light pinkish-gray in colour and fine-grained in texture. Four miles above the Cascade Portage, a large diabase dyke is seen at intervals for nearly half a mile along the north shore. As its contact with the surrounding granite could not be seen, its width and direction could not be determined, but its course is roughly parallel to the river, or about N. 45° E. This dyke is medium-grained in texture, dark-green in colour, and holds numerous small, porphyritic crystals of greenish-white plagioclase. Cascade Portage.

Exposures of hornblende-granite are very frequent to the mouth of the Misask River. Two miles and a half below that place, the rock is a medium fine-grained, light-gray, highly felspathic hornblende-gneiss. Dip S. 60° E. < 20°.

On the islands in the rapid immediately below that river, the same light, pink and gray hornblende-gneiss occurs, and here holds a few broken bands of dark-green hornblende-schist; while small fractures and cracks in the pink hornblende gneiss are filled with light-green serpentine. At the first portage above, an abundance of the same rock is seen, and here dips S, 60° E. < 5°-40°.

Beyond this point only angular blocks are seen, until the last portage before Long Portage Creek is reached, where similar fine-grained, light-gray and pink, highly felspathic, hornblende-gneiss occurs, holding broken bands of hornblende-schist. Strike N. 65° E.

No further exposures are seen along the route until the rocky portage on Long Portage Creek is reached, where there is a mountain formed of medium to coarse, red hornblende-granite, at times showing signs of foliation. Although no exposures of rock in place are seen in this long interval, yet, from the number of large angular blocks scattered about the river-bed and apparently not far-travelled, the rock underlying this section of country must be wholly hornblende-granite and gneiss. Above this to the second small lake beyond the Long Portage, loose blocks of granite are common, but no rocks are seen in place until they come out on the north side of that lake, where they are dark-pink, medium-grained hornblende-granite. The next exposure is seen at the small rapid at the entrance of Opemiska Lake, where the same granitic gneiss is seen lying nearly flat. Strike N. 80° E. Absence of rock exposures. Opemiska Lake.

On a small rocky island on the north side, half a mile from the eastern end of this lake, coarse, pink pegmatite-gneiss holding broken bands of hornblende-mica schist is again met with. Strike N. 80° E. At the lowest rapid on the river between Opemiska and Wahemen lakes, there are large exposures of medium-grained, pink, highly quartzose, hornblende-gneiss. Strike N. 80° E. It is associated with coarse pegmatite, the contact of which with the gneiss is covered, and above, in the rapid, there is a large development of dark-gray mica-hornblende-schist.

Hornblende-granite.

Half a mile farther up, at the short portage over a small island, there is a considerable thickness of dark-gray mica-hornblende-schist. Dip N. 30° W. < 50°. These beds are sharply cut by large dykes of pegmatite that hold considerable quantities of hornblende. Between this and the last exposures, on both sides of the river, the hills are formed of coarse, red hornblende-granite, from which the pegmatite runs out as dykes. Granite is seen on the shores and islands along the river to Lake Wahemen. These granites are often foliated, but commonly show no signs of structure. No exposures were seen along the shores of Lake Wahemen or of the small lakes between it and Patamisk Lake: but from the large angular blocks of granite it may be taken that this kind of rock underlies the drift of this region. Dark-gray mica-schists cut by pegmatite are seen on some of the islands in Patamisk Lake. Strike N. 80° E.

Green schists.

At the west end of the first small lake beyond Patamisk Lake, there are immense angular blocks of dark-gray mica and hornblende-mica-schist. On the south side of the same lake, half a mile from the portage, there is a large exposure of fine-banded, highly contorted hornblende and altered hornblende-schists. The bands are of various colours, being yellowish, white, light-green, dark-green and reddish-brown. Dip N. 70° E. < 50°. On the other side of the lake, and half a mile beyond, similar banded schists are seen. Dip N. < 60°. Some of the bands contain finely divided pyrites and weather brown. They closely resemble the rocks seen at Sharp Rock Portage on the East Main River. From here no rocks are seen in place until the Big River is reached, but the angular blocks on the next two portages are nearly all mica-schist, or a fine light gray mica-gneiss.

Upper Big River.

Great hornblende-granite area.

A great area of hornblende-granite is now entered, that extends from the Big River north-eastward to Lake Kaniapiskau, a distance of over one hundred miles. Throughout this distance, the rocks met with consist almost wholly of pink or red hornblende-granite, at times associated with hornblende-mica-granite and rarely including fragments of the bedded series of mica-gneisses. These granites are generally massive, and do not show signs of foliation, except in the segregated masses of hornblende that frequently occur with them. The segregations have commonly a schistose structure induced by pressure. Where the segregations are large and numerous, the remainder of the rock contains a very small proportion of hornblende, it apparently having been nearly all collected into dark-coloured masses. Some of the segregations contain a small amount of mica. Along the Big River above Nichicun Lake, the coarse, red granites are seen in two places; the lower being at the Sharp Hill, where the river enters Back Lake. Both exposures show no signs of foliation, are coarse in structure, and contain a very small percentage of mica.

Lake Nichicun.

The islands of Lake Nichicun are often rocky, and wherever examined the rock was found to be coarse-grained, pink and red hornblende-granite and mica-hornblende-granite, the former predominating. On the first portage below Nichicun Lake, a considerable exposure of medium-grained highly felspathic mica-hornblende-gneiss was seen, along with thin bands of dark-gray micaceous schist. Strike N. 80° E. For several miles below, rock-exposures are frequent along the river, and where examined show coarse-grained, pink and red hornblende-granite. At the lake-expansion below the third portage, the bedded series of micaceous gneiss is again seen. From here to beyond Lake Kiaswachigastook, the rocks are all granite. On Eagle Lake the granite in places shows signs of foliation. Strike N. 75° E. On both sides of the long bay of Snipe Lake there are numerous broken bands of mica-schists and mica-hornblende-schists inclosed in the granite, and this development of the bedded schists continues across the portage to Long Lake, where the granites again come in, holding many segregations of hornblende-schist inclosed in a magma of almost pure orthoclase.

Koksoak River.

Lake Kaniapiskau.

No rock in place was seen from here until the height-of-land was passed, but from the immense number of blocks and boulders scattered about, the underlying rock is taken to be hornblende-granite. From the height-of-land to Lake Kaniapiskau, a number of exposures were examined, and all were found to be hornblende-granite, sometimes including hornblende segregations, and rarely showing signs of foliation.

Change from granite to mica-gneiss.

On an island, off the discharge of Lake Kaniapiskau, the bedded series of gneisses is again seen as fine grained rusty-weathering dark-gray mica-hornblende-schist. Strike 10° S. The first exposure on the river is three miles below the lake, where an outcrop of dark-gray, schistose mica-gneiss occurs at a heavy rapid. Strike S. 85° E. No other exposures are seen for several miles, but from the many large blocks scattered about in the drift, the underlying rock is supposed to belong to the bedded series of gneisses.

The next exposure on the river is eight miles below the last, where the rock is a dark-gray mica-schist, with numerous thin bands of light-gray felspathic gneiss. Below this, there is an interval of twenty-two miles to the next rock-outcrop, which occurs at a rapid below the lake-expansions. Here the rock is a very coarse, pink pegmatite, some of the orthoclase faces being eight by ten inches. The rock contains a considerable amount of quartz in large rounded masses, and is singularly free of mica or hornblende. It resembles a great dyke over 300 yards wide, and appears to run N. 70° E. The same kind of rock is met with at the next rapid, one mile below the last. Similar rocks occur frequently for two miles below, when very coarse, pink and gray granite-gneiss appears. Dip N. 15° E. < 50°. Some of it has an augen structure, and there are also finer-grained bands. These rocks do not resemble the bedded mica-gneisses, and may represent irruptive granites, with the pegmatite dykes derived from the granite mass.

Pegmatite.

Rocks at the first gorge.

From here, along the east channel past the large islands, the river flows over many rocky ledges to the head of the first gorge thirteen miles below. These exposures show a great development of coarse to medium-grained gray granite, often with porphyritic crystals of white orthoclase, and charged with a considerable quantity of mica. Along with these are broken bands of finer, and often darker, mica-schist and granite-gneiss, that perhaps represent the bedded series. All these rocks are cut by dykes of coarse pink pegmatite. Along the gorge these rocks are continuously exposed for eight miles. The coarse red pegmatite here developes into a hornblende-granite, from the presence of dark-green hornblende, and it carries in cracks small veins of light green chlorite. These rocks cut the coarse-grained light-gray basic syenites or granites,* which in places contain well formed crystals of brown orthorhombic pyroxene. Associated with, and cut by both the granites, are large masses of mica-schist and fine-grained mica-gneiss, in the form of broken bands. These schists and gneisses are often highly charged with dark-red garnets, some of the crystals being nearly two inches in diameter. The general strike of the foliation is S. 75° E.

Basic granite.

For several miles below the gorge the valley continues narrow, with high rocky walls that afford an almost continuous exposure on both

*See No. 6, Appendix V.

sides of the stream. Owing to the heavy rapids in the river, the rock could only be examined at favourable landing places. Where examined the light-gray basic granites were found to predominate; they are at times garnetiferous and sometimes change to a mica-hornblende-granite from the presence of small quantities of dark hornblende. They then hold segregations of hornblende with a schistose structure. The rocks are often foliated, but still the general appearance and the well developed crystallization point to their irruptive origin. They continue to hold large fragments of the finer-grained, less metamorphosed, bedded series. The hornblende-granites and pegmatite dykes cut both of these rocks.

Hornblende segregations.

Eight miles below the gorge, and along the stretch of three miles where the river runs east, the mica-hornblende-granites are very abundant and hold many segregations of hornblende. The direction of the foliation is S. 75° E. They are penetrated by many large red pegmatite dykes, and cut by small veins of serpentine and steatite. Three miles below, where the river bends to the north-west, there is much fine-grained schistose hornblende-granite of a dark-green colour. Strike S. 55° E.

For the next eighteen miles, the rocks were examined at intervals, and were found to be similar to those already described. Garnets were often seen plentifully scattered through the mica-schists as well as through the granites, the former being found more largely developed as the river was descended. The general strike is S. 80° E.

Garnets.

For the next five miles the river banks are sandy, but farther down stream the same varieties of rock are seen, the granite changing to a mica-hornblende-granite from a free admixture of hornblende with the mica. Strike S. 75° E.

At the foot of the next long rapid, twelve miles below the last exposure, the rock is a medium-grained, greenish-gray, basic mica-hornblende-gneiss. It is composed chiefly of a yellow-weathering plagioclase, and holds a good deal of dark-green hornblende along with mica. It changes into the light-gray gneiss, and the rusty colour is probably due to decomposition. Strike S. 80° E.

Seven miles farther down, at a heavy rapid, a large diabase dyke was seen, but could not be examined, as it was impossible to land near it.

The next exposure examined was three miles above the mouth of Sandy River, where medium-grained, light gray mica-hornblende-gneiss was seen. Strike S. 60° E. Similar exposures were seen at the low chute a mile below, where the rock was found to be contorted on the strike, and holds a number of shattered bands of hornblende-schist. General dip N. $< 25°$

Sandy River.

At the second gorge, four miles below Sandy River, medium-grained, light-gray and pink mica gneisses and mica-hornblende-gneisses were seen in nearly flat layers. There are large masses of dark-green hornblende-schist in places, and these appear to be the remains of old dykes, foliated by pressure. The same rock is seen at the small chute one mile below, and there the dip is N. 15° E. < 20°-50°.

Eaton Cañon. At the head of Eaton Cañon, the same flat-bedded gneisses are seen, cut by large dykes of dark-red pegmatite, holding large decomposed crystals of green hornblende. The cañon proper is cut out of a medium-grained, dark-red hornblende-granite, from the mass of which the pegmatite dykes appear to be given off. The granite is extremely brittle and is much fractured along two sets of cleavage-planes; it is so minutely broken that it is next to impossible to obtain an ordinary hand specimen. These is a large dyke of fine-grained, compact diabase 125 feet wide, running N. 55° E. along the south side of the river. This dyke appears to have been the cause of the shattered condition of the granite, as the latter is more broken and friable near the contact than elsewhere. At the foot of the cañon, the granite is again displaced by the medium-grained, light-gray mica-hornblende-gneiss, that forms the steep rocky walls of the river-valley to the mouth of the Goodwood River.

Below the Goodwood, the walls continue high and rocky for many miles. Five miles down, the rocks, where examined, consist of coarse to fine-grained, gray and pink mica-hornblende-gneiss. Strike S. 75° E. Six miles farther down the same gray and pink granite-gneisses are seen, cut by red hornblende-granite. Strike E. Two miles above

Granite Fall. the Granite Fall, only coarse-grained, hornblende-gneiss with light-green hornblende is seen. Strike S. 45° E. At the fall the rock is also coarse, pink and red hornblende-gneiss, including lenticular masses of dark hornblende-schist, often much broken. The gneiss is considerably contorted, but the general dip is N. 45° E. < 40°.

For seven miles below the falls, the river has banks cut out of drift, which conceals the underlying rock; then the rocks are seen at the bends of the river, where the heavy rapids occur, and where a landing cannot be made. In consequence, no exposure was examined for twelve miles below the falls, where a highly contorted, coarse-grained, gray and red hornblende-gneiss was seen.

The valley now widens out, and there is a considerable interval of drift between the river and the rocky hills. In a few places low hummocks of red hornblende-gneiss are found along the shores. At times the gneisses are massive, but they generally shew signs of foliation, and have a general dip of N. 45° E. < 20°-70°. These characters continue till the crystalline rocks are replaced by the overlying Cambrian strata. Sixteen miles below the Stillwater River, the Laurentian rocks are again found rising from below those of Cambrian age, although the latter still form the summits of the hills on both sides of the valley. The first exposure on the south side of the river shows finely banded, pearly-gray schists, somewhat calcareous, with plates of silvery hydromica, and in some of the bands green hornblende and chlorite. The hornblendic bands are full of dark-red garnet, some of the crystals being nearly two inches across. These bands are vertical, and the strike is S. 45° E. A curious coincidence is that, on the Hamilton River, near the eastern contact of the Laurentian and Cambrian rock, similar beds of hydromica-schists are met with. Three miles below, on the same bank, the Laurentian rocks are again seen, and are here fine-grained, gray mica-gneiss, cut by large masses of red pegmatite. Dip N. 55° W. < 40°.

Contact of Laurentian and Cambrian

Garnet schists.

On the summit and side of the hill in rear of the last exposure, the rock is a fine-grained, dark mica-schist, interbanded with coarse-grained pink mica-gneiss. Dip N. 75° W. < 10°-40°. On the north bank at the Head-of-tide Rapid, medium-grained pink mica-gneiss is met with. Dip S. 35° E. < 40°. Below this there appears to be only patches of the Cambrian rocks on the tops of the hills on the north side of the valley, and these soon disappear.

From five miles below the rapid, there is an almost continuous exposure along the south shore for nearly four miles. Along the upper part the rock is largely fine-grained, light-gray mica-gneiss. Dip S. 75° E. < 40°. A mile below, a section of 400 feet of banded, light and dark-coloured mica-schists is seen, along with thin bands of dark-green, hornblende-schist. Dip S. 65° E. < 10°-30°. Some of the dark micaceous bands are full of small, dark-red garnets.

Fort Chimo.

Similar schistose rocks, cut by large veins of pegmatite, appear on the high rocky islands, above the Hudson's Bay post. Immediately behind the post, is fine-grained, gray and light-pink mica-gneiss, cut by large dykes of pegmatite. Strike N. 45° E. Similar rocks now bound the river on both sides to its mouth, and they all appear to belong to the bedded series of dark gneisses, except the pegmatites, which may represent dykes from some irruptive masses in the vicinity, not seen along the river.

George River.

About George River, the country is high and rocky, and near the Hudson's Bay post the rocks are contorted, gray mica-gneiss, cut by fine to coarse-grained red hornblende-granites. The high country eastward of the Hudson's Bay post is mostly bare rock, and shows gray and pink granite-gneiss, cut by large masses of red hornblende-granite.

Near Port Burwell, the rock is a highly contorted, fine to medium-grained, red hornblende-gneiss cut by large dykes of dark-green diabase.

Lower Hamilton River.

Muskrat Falls.

The first rock seen in place along the Lower Hamilton River, is at the Muskrat Falls, where the river passes over a number of ledges of dark grayish-green, diorite-gneiss,* along with medium-grained, light-gray and pink mica, and mica-hornblende gneiss. These rocks are greatly contorted along their strike, which appears to be about N. 80° E. About five miles above the falls, a rocky spur projects from the south wall of the valley, giving an exposure a quarter of a mile long on the bank of the river, where contorted, medium-grained, pink and gray mica-gneisses and mica-hornblende-gneisses are seen.

Cambrian rocks.

On the north shore at Sandy-banks Rapid, there is a low cliff of coarse, light-red sandstone along with bands of fine conglomerate of irregular thickness and of Cambrian age. No other exposures are met with until the second bend of the Horse-shoe Rapids is reached, where there is a high cliff of fine-grained, dark-gray mica-gneiss with coarse, light-gray and pink augen-mica-gneiss. Dip S. 65° E. $<$ 70°.

Along the south shore of the river, from here to the mouth of the Minipi River, there is an almost continuous exposure of gneiss and granite, which could not be examined, owing to the river being open along this part, and to the impossibility of travel on the ice along that shore. Immediately above the Minipi River, there is a large exposure of dark-red hornblende-granite, with gray and pink mica-hornblende-gneisses and mica-gneisses. Dip S. 75° E. $<$ 50°.

Pyroxenite.

Five miles above the Minipi River, a large dyke of very coarse-grained pyroxenite† crosses the valley and narrows the river-channel to less than one hundred yards, with an island on the south side. On this island the rock is well exposed. It has a brownish colour, and is much rotted on the surface, where it is broken into great rounded masses. It is formed of a jumble of large crystals of rhombic pyroxene and holds a good deal of black mica in small scales. The direction of the dyke is S. 5° E., and it exceeds seventy feet in width.

No rock is seen in place in the river-valley for thirty-five miles above this dyke, and until the valley again becomes quite narrow about three miles above Squirrel River. But an examination of

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*No. 11, Appendix V. †No. 13, Appendix V.

scattered angular blocks shows that the underlying rocks are largely mica-gneisses. Above this, up to Lake Winokapau, exposures are frequently met with on both sides of the river. The first is on the north side and shows a band of coarsely crystalline limestone, enclosed in coarse, highly felspathic augen-gneiss, associated with finer gray mica-gneiss. The limestone band is very irregular and varies from one to four feet in thickness only. In colour it ranges from pure white to a beautiful cobalt-blue and contains no associated minerals. Strike N. 75° E. The next exposure examined was on the south shore, three miles higher up, where the rock was found to be medium to fine, dark and light-gray mica-gneiss, along with apparently broken dykes of dark-green schistose hornblende. Strike N. 35° E. Limestone.

A mile above the last, medium-grained, gray and pink augen-mica-gneiss was seen, together with fine-grained mica-gneiss, in broken bands. Strike N. 35° E. The orthoclase of the augen-gneiss has often a beautiful pearly lustre.

From here to Lake Winokapau, all the rocks met with were coarse, highly felspathic augen-mica-gneiss, varying in colour with the felspar, from white through yellow and pink to red. At the entrance of the lake, the rocky walls rise 1000 feet sheer, and huge angular blocks, fallen from above, are piled up at the base of the cliffs. On the surface of one of these large blocks is a beautiful example of the secondary crystallization of hornblende, which is nearly always present in small quantities in these rocks. The needle-like crystals vary from one-tenth to one-fortieth of an inch in diameter, and from a half to two inches in length; they are arranged so as to radiate from centres, thus forming dark-green stars. Augen-mica gneiss.

The next exposures of rock, on the north shore of Lake Winokapau, twelve miles above its outlet, are schistose to medium-coarse, pink mica-gneiss. Strike N. 80° E. Exposures of mica-gneiss and mica-hornblende-gneiss continue for three miles along this shore, and these are cut by a dyke of dark-brown, coarse-grained pyroxenite similar to that already described. This dyke is more than one hundred feet wide. On the south side, sixteen miles above the outlet, and for four miles beyond its first appearance, the shore is high and rocky. The rock is mostly gray, fine to medium-grained mica-gneiss, cut by small veins of white pegmatite. Dip N. 10° W. < 45°. Lake Winokapau.

The north shore, for three miles below the lower island, at the head of the lake, rises in perpendicular cliffs of contorted, micaceous gneisses mostly pink in colour. There appear to be two series of rocks represented, the most abundant being a coarse augen-gneiss or granite, which in places holds large, almost perfectly developed crystals of

Mica.

orthoclase. The other is made up of fine to medium-grained mica-gneiss, sometimes schistose, and probably an altered clastic rock; whereas the first series has every appearance of an igneous origin, and encloses broken bands of the schistose rock. At the small point on the north side, opposite the lower island, there is a large dyke of very coarse, red pegmatite, formed of large crystals of red orthoclase (9x12 inches), and holding much brown mica in crystals, up to four inches in diameter. Masses of translucent quartz in the pegmatite hold large crystals of black hornblende. At the bend one mile below the mouth of the Metchin River, there is a low cliff of fine-grained mica-gneiss, the dip being N. 60° E. $<$ 20°–50°. Opposite the mouth of this river, dark-gray mica-gneiss is seen holding large quantities of dark-red garnets; these are mostly small, but some crystals are half an inch in diameter. Dip S. 80° W. $<$ 40°.

Quartz-diorite

No rock is now seen for six miles, to the next sharp bend of the valley to the northward. Here, on the east side, are two or three small exposures of fine-grained gray and pink mica-gneiss. Dip S. 20° W. At the upper end of the bend, and on the opposite side of the valley, a prominent hill rises vertically from the water. The rock here is a dark-green, medium-grained quartz-diorite, made up chiefly of dark-green hornblende, with irregular spots of plagioclase and a small amount of quartz. The relation of this rock to the mica-gneisses, which again outcrop on the east side above the bend, is unknown.

The valley from here is free from rock for sixteen miles, to where a point projecting from the north shore, shows highly contorted, mica-gneisses, associated with red hornblende-mica-gneiss. Strike E. to S. Large, angular blocks fallen from the cliff, opposite the mouth of Portage River, are all composed of mica-gneiss.

The next exposure is one mile above the Big Hill Portage, where dark-red hornblende-gneiss is seen. Rock in place is again seen in the river bed at Disaster Rapid, six miles above the portage, and from here to the mouth of Bowdoin Cañon exposures are of frequent occurrence. Only the north bank of the river was examined owing to the stream being open.

Disaster Rapid.

At Disaster Rapid, the rock is a medium-grained, light and dark gray and pink mica-gneiss. Strike N. 80° E. One mile above, the same rocks were seen with highly felspathic, pink bands. This is followed, half a mile above, by an exposure, a quarter mile long, of red mica-gneiss and mica-hornblende-gneiss, in which the hornblende is much decomposed. These rocks are distinct from the banded mica-gneisses, and are associated with coarse augen-gneiss. A quarter of a mile above, the augen-gneiss is found along with broken bands of fine-grained mica-gneiss. Dip S. 60° W. < 40°.

These are followed, two miles beyond, by light-gray mica-gneisses, cut by broken bands of dark hornblende-schist, that are apparently formed from ancient diorite dykes. Along with these gneisses, and seemingly interbanded with them, are gray hornblende-gneiss and a very felspathic, pink hornblende-gneiss. Strike S. 5° W. The next exposure is half a mile above, and consists of medium-grained, dark and light-gray mica-hornblende-augen-gneiss, with a few bands of pink hornblende-gneiss. A short distance above the last, coarse hornblende-mica-gneiss and hornblende-augen-gneiss are again seen, not well foliated. Strike S. 65° E. This rock is more basic than any yet passed, and has the characters of an intrusive mass cutting or displacing the banded mica-gneiss.

No exposure is now met with for three miles, or to within a half mile of the mouth of the cañon, where a medium-grained schistose hornblende-gneiss is found, associated with a dark-red, compact hornblende-gneiss, holding very little quartz, as well as similar bands with both hornblende and mica. These rocks are highly felspathic and are very brittle, splitting along several jointage-planes. They have been greatly shattered and have been recemented by veins of chlorite and serpentine. Dip S. 60° E. < 40°-80°. The Bodwoin Cañon, for the greater part of its length, is cut out of this kind of rock, and its shattered condition and friable nature must have greatly aided the erosive action of the water. Hornblende-gneiss.

At the Grand Falls, the rock forming the walls of the basin and the ca on to below the first bend, is a coarse-grained augen-mica-gneiss. Strike S. 50° W. The foliation planes dip at a high angle, but the rock splits up into great blocks along several planes, one of which is nearly horizontal, and there appear to be two other principal planes, one running nearly east and the other south-west. The direction of these principal lines of jointage corresponds to and probably determined those of the reaches of the cañon immediately below the falls. Similar rocks, above the falls, are cut by bands of coarse hornblende-mica-augen-gneiss, and both are cut by large dykes of dark-green, medium-grained diorite. Grand Falls.

Upper Hamilton River.

One mile above the falls, these rocks are exposed along the shore for a quarter of a mile, and here they appear to change gradually into mica-schists and mica-hornblende-schists by the reduction in amount of felspar.* Several bands of dark-green hornblende-schist are seen interbanded with the gray schists, but are found on close examination to cut the latter, and are in all probability squeezed diorite dykes. On the east bank, one mile farther up stream, is a very felspathic, red gneiss, with thin partings of mica, and at times chlorite; this rock is interbanded with ordinary, gray mica-schists. Dip S. 10° W. < 70°.

Gabbro.

On the islands, at the outlet of Jacopie Lake, two miles and a half above the last exposure, are large masses of unstratified uralitic gabbro† enclosing broken bands of mica-gneiss.

On another island, half a mile eastward of the outlet, bluish-gray augen-mica-hornblende-gneiss is seen; strike E. The same rock was also seen, on the low hills, along the south-east shore of the lake.

The rocks underlying the portage-route past the Grand Falls, appear to be coarse augen-mica-gneisses and mica-hornblende-gneisses, cut by large masses of uralitic gabbro, which, owing to its superior hardness and weathering qualities, now rise as rounded hills from 100 to 500 feet above the general level of the surrounding country. Four of these hills were ascended, and each was found to be composed of medium-grained gabbro, in some places very felspathic. There are also several exposures of gabbro seen on the islands of Jacopie Lake. The rock varies from fine to coarse grained, and often holds considerable mica. At the entrance to the narrow east channel at the head of the lake, thin bands of coarse-grained, red hornblende-granite are met with, cutting the gabbro.

A small exposure of medium-grained, gray and pink hornblende-granite-gneiss outcrops on the east bank nearly two miles above the head of the channel. This rock carries much bluish-white translucent quartz, and is somewhat contorted, with a general strike S. 60° W.

No rock was seen in place for several miles until the small hill on the west side near the outlet of Flour Lake was examined, where the rock was found to be dark-gray mica-gneiss.

Rocks of Flour Lake.

The islands of Flour Lake appear to be all formed of hummocks of fine to very coarse-grained, dark-brownish and greenish gabbro, made up largely of coarsely crystalline plagioclase, with irregular masses of augite or hornblende, hypersthene and mica, and also holding small grains of ilmenite. The coarser masses are badly weathered and decayed on the surface, the rock resembling a typical anorthosite, while the finer-grained rocks are similar to the gabbros of Jacopie Lake and Lookout Mountain, and all may have come from the same or nearly contemporaneous outbursts of igneous matter.

* No. 19, Appendix V. † No. 12 Appendix V.

At the head of Flour Lake coarse-grained, red, very felspathic hornblende-gneiss crosses the river, with its strike N. 50° W. Similar rock, only finer grained, is met with three miles up the river, where it is much contorted and encloses masses of hornblende-schist. Beyond, no rocks are seen in place along the south channel of the river for ten miles to Sandgirt Lake. There are great numbers of angular blocks of hornblende-granite scattered everywhere along this interval, and this rock probably underlies the drift here. At the outlet of Sandgirt Lake there is a small island of coarse, red hornblende-granite, cut by small veins of finer-grained, similar rock.

Sandgirt Lake.

There are very few rock exposures about the shores or on the islands of Sandgirt Lake, but on two small islands near the middle of the lake are huge angular blocks of light-gray and pink mica-gneiss, much contorted and holding inclusions and broken bands of hornblende-schist. On an island at the northern outlet of the lake is a ledge of fine-grained red hornblende-mica-gneiss; dip N. < 45°.

Ashuanipi Branch.

The first exposures along the shores of the Ashuanipi Branch occur at the foot of the hill on the north side, four miles above Sandgirt Lake. The rock on the top of the hill is an unfoliated gabbro like that of Lookout Mountain, which changes to a gabbro-gneiss on the eastern flank. The same rock comes out on the river at the south-west end of the hill, and here, as also on an island immediately above, shows obscure foliation striking S. 40° E. There is much broken fine-grained red hornblende-gneiss along the southern flank of the hill, which appears to have been baked by the intrusion of the gabbro and is very brittle.

After this no rock in place is seen along the river for ten miles, when a long exposure occurs on the north bank, consisting of evenly banded light-gray and greenish sericite and talc-schists, with a few narrow bands of a fine-grained slaty, altered hornblende-rock holding pyrites; dip N. 65° E. < 25°-60°.

Rocks like those on Koksoak River.

These rocks closely resemble those met with on the Koksoak River immediately after leaving the Cambrian area, and those here noted are again immediately followed by rocks of the Cambrian series to the westward. This is probably only a coincidence, and does not show that the Cambrian has an altered series attached to its base, as the Cambrian strata found a few miles farther up-stream are of detrital sand-rock and bear no resemblance to the schists, which resemble the Huronian lithologically.

At a point a short distance above the exposure of schist, a portion of a large dyke is seen, made up of very fine-grained dark-green altered hornblende and plagioclase, with a considerable amount of pyrites disseminated through it.

In the small lake-expansion, six miles above, the bedded sandstones of the Cambrian appear on several small low islands, and from here to the upper end of Menihek Lake the country passed through is underlain by rocks of this age. A description of these rocks is given farther on.

Above Menihek Lake.

Along the river, above Menihek Lake, to the end of the exploration on the Ashuanipi Branch, there is only one exposure of rock in place, and that is near the end of the survey, where dark pearly-gray hydromica-schists are found with thin layers of white orthoclase and quartz, associated with dark-greenish chloritic schists; dip, S. 10° W. < 35°. Below this place, in the river-valley, to the Menihek lakes, large angular blocks of dark schist are met with frequently, and these rocks probably underlie the drift of this area. They resemble rocks of volcanic origin and are possibly plutonics of the same period as the Huronian rocks of the East Main River; they may be better correlated with these than with the Laurentian gneisses.

The small rounded hill at the end of the survey, is formed from a mass of medium-grained dark-green diabase.

Route to Lake Michikamau.

North of Sandgirt Lake

At the northern outlet of Sandgirt Lake, medium-grained, red hornblende-mica-gneiss occurs on several small islands. Dip N. 60° E. < 45° This rock is composed chiefly of red orthoclase and hornblende, and breaks up into angular fragments, along different jointage-planes, like similar rock at the outlet of Bodwoin Cañon. At the rapid, where the channel discharges into Lob-stick Lake, there is a coarse-grained, greenish-gray hornblende-mica-gneiss, holding small broken dykes now converted into hornblende-schist. At the foot of the rapid, the rock is a well-banded, light-gray and pink mica-gneiss. Strike N. 10° W.

Lob-stick Lake to Michikamau.

The geology of Lob-stick Lake and the country beyond, to the head of the eastern bay of Lake Michikamau, is very complicated, and would require much more study and examination to work it out than it was possible to give it on a hurried trip through the lakes. This area is remarkably free from drift, and in consequence the rocks are everywhere exposed along the shores, and on the myriads of small islands of the lakes. From the hasty examination made, it would appear that the route passes close to the contact of a great area of coarse-grained, red hornblende-granite, like that about Lake Nichicun, with an older series of foliated mica-gneisses and mica-hornblende-gneisses. The contact of these rocks was examined in a number of places, and everywhere the hornblende-granites cut the gneisses. The latter, near the contact are much contorted, and at the contact become darker and change from mica-gneiss to mica-hornblende-gneiss, from an admixture of hornblende, perhaps absorbed from the hornblende-granite. Both series are full of broken masses, or bands of hornblende-schist, the probable remains of old diorite dykes that cut the rocks previous to the final squeezing and folding, when they were broken up and changed to their present condition. All these rocks are cut by several large diabase dykes, which are undoubtedly of much later age.

Michikamau Lake.

At the head of the east bay of Lake Michikamau, the hornblende-granites give place to light-gray, talcose and hydromica-schists, holding small garnets, with partings of white orthoclase and quartz, closely resembling the rocks of the Ashuanipi Branch, at the contact between the Laurentian and Cambrian. Strike N. 25° W.

No exposures are seen along the shores of the east bay, or on the west side of Lake Michikamau for eight miles northward, up to where low rounded bosses of anorthosite come out along shore and on the small islands fringing it. These rocks continue along this side of the lake for thirty miles, or up to within four miles of the north end. The rock is everywhere very constant in its physical characters. It is almost wholly formed of coarsely crystalline masses of dark-purple anorthosite, or labradorite, holding masses of dark brown hypersthene, and ilmenite, and at times mica. The rock is badly weathered to a depth of several inches below the surface, and disintegrates, leaving rounded cores. The labradorite, where weathered, has a dark, greenish-brown colour. It is so coarse that cleavage faces six inches across are not uncommon. Anorthosite

The mass of dark-purple anorthosite includes large patches, or rather bands, of a lighter coloured and finer grained variety, due to the segregation of the almost white plagioclase from the darker.

The hypersthene is present in crystalline masses from one to eight inches in diameter. The ilmenite has no definite crystallization, but occurs as irregular masses, generally small, although sometimes measuring more than a foot through.

Hornblende-granite.

About four miles from the north end of the lake, the anorthosites give place to a coarse, red hornblende-granite, which occupies the shore for a couple of miles and then passes under the drift, at the head of the lake. The contact of the anorthosite and granite is concealed and their relations are consequently unknown.

Labradorite.

The north end of the lake is low, and the shores are formed of sand and boulders; the western side is also low for twenty-two miles from the north end, to where a ridge of anorthosite hills projects into the lake, forming a prominent point and large high islands. From here, anorthosite is found on every point along the shore for nearly twenty miles. In physical characters this rock closely resembles that of the opposite side of the lake, except that the felspar has the peculiar opalescent character of labradorite, with a play of colours showing dark-blue, light-blue, green and bronze-yellow. Some of the crystals are six inches by eight inches, and at times the outline of the crystal and lines of growth are beautifully marked by the different colouring. The precious variety of the rock is not confined to veins or dykes, but includes the whole mass. Owing to the badly weathered condition of the rock, good specimens could not be obtained above water without blasting. The beauty of the rock was best seen along the shore below the water-level, where the surface protected by the water was fresher and had been smoothed and polished by glacier-ice. Here, looking down through the clear water, the play of colour from the numerous large crystal faces is most beautiful.

Hornblende-granite resumes.

About eight miles north of the outlet of the lake, hornblende-granite replaces the anorthosite and again the contact is concealed. Exposures of granite are frequently met with up to the high hill just north of the discharge. This hill is granite with patches of bluish-gray Cambrian limestone. At the base of the hill is a large exposure of pink and gray hornblende-granite, with an obscure foliation in the direction N. 30° W. From here, for fourteen miles, to the south end of the lake, the western shore is low and formed of sandy drift, strewn with large angular blocks of Cambrian sandstone. The south end of the lake is shallow and filled with small rocky islands of coarse, red hornblende-granite, that are often thickly strewn with huge, angular blocks of Cambrian limestones and sandstones. The west shore of the lake is also low and drift-covered from the south end to the entrance of the eastern bay.

Attikonak Branch.

From Sandgirt Lake to the first lake expansion, the Attikonak River passes through an area of red hornblende-granite and hornblende-mica-gneiss, evidently of igneous origin. The first exposure, about one mile up the river, shews fine, pink hornblende-mica-gneiss, interbanded with darker hornblende-schists. Strike N. The gneiss has partings and small cracks filled with light-green chlorite and serpentine. The second exposure is about five miles farther up, and is formed of well banded, medium-grained, red and dark greenish-gray hornblende-gneiss. Strike N. 20° W. There are numerous exposures along the ten miles of river below the lake-expansion, and they are all medium-grained, red hornblende-granite with green hornblende and partings of chlorite, the orthoclase at times being developed into small porphyritic crystals. Strike N. 10° W.

Hornblende-granite and gneiss.

With the south bend of the stream, as it passes through the small lake-expansions after leaving Lake Ossokmanowan, there is a distinct change in the underlying rocks, which now apparently become bedded argillites, altered grauwackes, and chloritic schists, cut by large diabase dykes. These rocks are frequently exposed, until they are seemingly cut off by a great area of gabbro, near the north end of Ossokmanuan Lake. Up the stream, the first exposure of these rocks is seen on a long point opposite the discharge of the first lake, where the rock is a fine-grained, dark-green chlorite, somewhat schistose in character, and probably the remains of an ancient dyke. Strike S. 80° W. The next exposure is nearly a mile above, where a large dyke of medium-grained, greenish-gray diabase is seen giving a beautiful example of the phrenocrysts of plagioclase. The contact of this dyke with the adjacent rocks was not seen, so that its width and direction are unknown. On the next point, half a mile above, dark-green chlorite-schists are found, interbanded with a very siliceous grauwacke holding small scales of secondary mica and evidently highly altered. Black slates are also interbanded with the last. On the opposite side, and a mile farther up stream, are light-gray sericite-schists, together with altered grauwacke. Strike W. The last two exposures are on islands in the north end of Ossokmanuan Lake, where exposures of dark anorthosite are seen along the west shore. The rock on the islands is light-gray in colour, very siliceous, and is probably an altered grauwacke. Strike N. 50° W. The above-described rocks, taken together, resemble strongly certain aspects of the Huronian, and are probably an extension of the Huronian area met with on the upper part of the Ashuanipi River, the strike of the

Rocks probably of Huronian age.

Ossokmanuan Lake.

rocks being such that, if continued, they would cross that stream at this place.

Large area of anorthosite.

The anorthosite area appears to be largely developed to the south-west of Ossokmanuan Lake, and its characteristic rounded knobs are seen frequently along the west shore and islands of the lake for ten miles, to the mouth of the large south-west bay. The eastern side of this part of the lake seems to lie along the contact between the anorthosite and a hornblende-mica-gneiss, which is seen on the east point of the first narrrows, with anorthosite on the other side of the lake. The anorthosite is generally coarse-grained and almost wholly made up of large crystalline masses of plagioclase, without any play of colour, as seen in the rocks of Lake Michikamau. In some places the rock is medium-grained and contains much pyroxene. This is probably near a contact, as the rock is cut by small dykes or veins of red orthoclase and hornblende. The colour of the mass varies from dark-green to dark-violet, and on the surface weathers to a brownish-green. In the coarser rock, hypersthene and ilmenite are always present in varying quantities.

Further exposures on Ossokmanuan Lake.

No exposures occur along the lake for the next seven miles, but the broken rock scattered everywhere is chiefly coarse grained hornblende-mica-gneiss, and this rock probably underlies the drift. The two large islands that stretch down the middle of the lake, are high and rocky, and from a distance appear to be formed of gabbro. Along the west side of the lake, five exposures are seen in six miles opposite the northern island. The first is a fine-grained, compact, dark greenish-gray basic rock, that is much decomposed but was probably a diabase. It holds fragments of coarse, red hornblende-granite and has an indistinct foliation N. 10° E. It is either a large dyke, or the contact rock of the basic mass with the granites, most probably the latter. The next two exposures are close together, and show a similar rock, with obscure banded structure due to the development of white plagioclase crystals in thin lines. Two miles beyond, these rocks again hold broken bands of red hornblende-gneiss. Strike N. 75° W. The last exposure, a mile further on, is medium dark-gray gabbro-gneiss composed chiefly of rusty-white plagioclase and pyroxene. Strike N. 20° W.

From here the shores of the lake are low and drift-covered for eighteen miles, to where rock in place is again seen for three miles, on several small points, to the mouth of the river. The first exposure is fine-grained, dark-grayish-green, altered diorite or diabase cut by small veins of red pegmatite. Two hundred yards beyond, there is a large exposure of fine-grained, pink mica-gneiss, very much contorted.

At the next point, half a mile farther on, the same gneiss is seen, and is here uncontorted. Dip S. 70° W. < 40°. More exposures of this gneiss, which appears to represent the bedded series, are met with frequently along the river for three miles above the lake, when the drift again covers the rock, and no exposures are met with until Lake Panchiamiskats is passed.

Ossokmanuan to Attikonak Lake.

Between this lake and Lake Attikonak, the mica-gneisses are mixed up with a coarse augen-gneiss that appears to cut the bedded series. At the inlet of the lower lake, on the points and islands, are numerous exposures of coarse augen-gneiss. Strike N. 20° W. This rock is formed of fine-grained, light-gray mica-gneiss, holding strings of well developed crystals of red and pink orthoclase up to $1\frac{1}{2} \times \frac{3}{4}$ in.

Two miles up-stream is a small island of medium-grained bluish-gray hornblende-mica-gneiss. The orthoclase has a purplish tinge. Strike N. 10° E. Along the river above this exposure, the augen-gneiss is often exposed, together with fine-grained, gray and pink mica-gneisses. At the portage these rocks are banded with twenty-five feet of dark greenish-gray hornblende-gneiss. Dip N. < 25°. Above the portage the augen-gneiss appears to die out, leaving only the bedded series of banded mica-gneisses. General strike N. 30° W.

Rocks of Lake Attikonak.

In the northern part of Lake Attikonak only one exposure of rock in place was seen on the west side, about three miles above the outlet, where a reef of fine, pink granite-gneiss (Dip S. 80° W. < 40°) forms a line of low islands. Beyond this for twenty miles, the shores and islands are covered with drift, and no rock is seen in place until a small island is reached four miles from the narrows leading to the south-east bay. From the number of angular blocks of mica-gneiss scattered along the shores, it is believed that similar rock underlies the drift and must be interbedded with white crystalline limestone, which is also found in angular blocks along shore. On the island above mentioned, and in several places along shore to the narrows, medium, red hornblende-mica-gneiss is met with. It is contorted and shattered, and the small cracks are filled with light-green serpentine. Strike N. 80° E.

Anorthosite.

Beyond the narrows no rock is met with for four miles, until a bunch of small islands is reached. From here to beyond the head of the bay the country is quite rough, with the rounded hills characteristic of an anorthosite area. On the first island, medium-grained, violet anorthosite is found, penetrated by small veins of pink orthoclase. The anorthosite holds considerable quantities of ilmenite in small masses that are often crystallized; pyrites is also present in small grains, along with brown hypersthene. There are a few small cavities in the rock partly filled with green saussurite. On the next island the same rock is seen holding much hypersthene. There is a well-marked contact between the coarse violet anorthosite and a gabbro-gneiss on the next small island. The dark-coloured anorthosite cuts straight across the gneiss, the direction of the contact being S. 30° E., while the strike of the gneiss is E. The only difference in the anorthosite close to the contact is that it appears to be slightly finer-grained than away from it. The gneiss is a moderately coarse-grained gray rock, composed chiefly of white plagioclase with a granular structure. It holds bands of biotite and dark hornblende, and is often highly garnetiferous, some of the crystals of that mineral being an inch in diameter and of a dark-red colour.

Gabbro-gneisses.

Similar gabbro-gneisses are met with in several places farther along our route to the southward, and they are everywhere intimately associated with the unfoliated rocks. Their crushed appearance and foliated structure, together with the development of mica, hornblende and garnet, leads to the opinion that these gneissic areas are only patches in the great masses of unaltered gabbros, that for some unknown cause have been subjected to great pressure, and that the line of contact with the unfoliated mass is simply a line of fracture.

The next exposure examined was on the point on the west side, a mile and a half south of the islands; here the foliated gabbro is again seen, but the gneissic structure is not so well marked as on the former exposure, owing to the small quantities of mica present. Strike N. 60° W. On the small island, a quarter of a mile from this point, coarse, violet anorthosite is found, holding large quantities of dark-green saussurite and a few large dark-red garnets. The dark, unfoliated anorthosite is exposed frequently up to the head of the bay, and in a number of places large veins of red pegmatite are seen cutting it. At the head of the bay a six-inch band of mica-gneiss is inclosed in massive gabbro.

Romaine River.

Rounded hills of massive anorthosite are met with along the portage-route to the Romaine River, and the area appears to extend far to the south-west, forming the high rugged hills seen in that direction, beyond Lake Attikonak.

For about four miles below the place at which the portage-route reaches the Romaine River, there are numerous exposures of anorthosite. Opposite the mouth of the portage creek the rock is white and granular, and resembles coarse loaf-sugar. This fine-grained rock holds small masses of coarsely crystalline, violet anorthosite, and masses of brown hypersthene, often several inches in diameter. The hypersthene often exhibits a zig-zag crumpled structure. Ilmenite is also scattered through the white rock in grains and sometimes in irregular lumps several pounds in weight.

Anorthosite of two varieties.

At the head of the rapid, two miles below, the same white, granular anorthosite is seen, with an indistinct foliation N. 70° E. At the portage, a short distance lower down stream, the foliated, white anorthosite, holding many coarsely crystalline lumps of the darker variety, are associated with a light-gray gabbro-gneiss, made up of the granular anorthosite with considerable biotite, hornblende and ilmenite, that give to the rock its gneissic structure. In some places, ilmenite alone is present, and is arranged in thin bands of grains, separated by the plagioclase and thus forming a gneiss. All these rocks are cut by veins or dykes of red pegmatite that vary from a few inches to several feet in width. On the small islands, the masses of coarsely crystalline, violet anorthosite are very numerous, and some of the faces show the opalescent blue, green and bronze-yellow peculiar to labradorite. These masses appear to represent cores of the original rock in an unaltered state, whereas the white granular variety that encloses them, seems to have been formed by the same or a similar pressure to that which induced the gneissic structure in the foliated variety.

Gneissic area entered.

Below the portage, the character of the surrounding country changes; the sharp rounded hills characteristic of the anorthosite areas, give place to flatter and more undulating hills, probably formed of gneiss. No exposures of rock are seen along the river, below this place, nor along the drift-covered shores of the first and second Burnt Lakes, but the underlying rocks are probably hornblende-granite and gneiss. At the outlet of the second lake, coarse-grained, dark-green hornblende-schist is seen, penetrated by numerous small, red orthoclase veins. Strike S. 70° E. The next rock seen in place, is in the rapid at the outlet of the lowest Burnt Lake, and consists of a coarse-grained red hornblende-mica-gneiss.

Exposures below Burnt Lakes.

The river on leaving the Burnt Lakes enters a distinct valley with rocky walls. This valley is partly filled with drift, and the river-channel is cut into the drift, in consequence of which very few rock-exposures are seen along its banks.

Five miles above the junction of the upper western branch, there is a small exposure of coarse-grained, red hornblende-granite, very felspathic, and holding a little mica. Below this no rock is seen for sixteen miles, until the upper chute is reached. Here coarse-grained mica-hornblende-gneiss and hornblende-gneiss occur on both sides of the stream. The rock is mostly red and pink, with some finer broken bands of a dark colour, probably squeezed segregations of hornblende and mica. Strike E.

At the lower chute, the same coarse, pink and red hornblende-mica-gneiss is seen, often with an augen structure. Strike N. 80° E.

The next exposure is twenty-two miles farther down-stream, or four miles above where the portage-route to the St. John River turns off, and the interval is probably occupied by hornblende-mica-gneisses. Here medium to fine-grained, pink and gray hornblende-mica-gneiss is seen, with some of the bands holding small red garnets. Strike N. 70° E.

Portage-route between Romaine and St. John Rivers.

No rock is seen in place, until the first lake of the portage-route is reached, where a great area of anorthosite is entered, that extends far down the St. John River.

Anorthosite-gneiss.

On the first lake, the rock is a light-gray anorthosite-gneiss, made up of granular, crystalline, white plagioclase and mica, and closely resembling that described on the upper Romaine River. On the portage leading from the second lake, a light, violet-gray anorthosite * is seen, holding small quantities of mica, hypersthene and ilmenite. This rock is coarser than the last and does not appear to have been subject to as great pressure. At the lower end of the long portage leading to the first small branch flowing into the St. John River, white, granular anorthosite is seen, enclosing a large mass of light-pink, very quartzose hornblende-granite.

Cliffs of anorthosite.

As far as the next branch, some six miles, the stream is hemmed in between perpendicular walls of anorthosite that rise more than 300 feet. Most of the rock seen is of the light-coloured, granular variety, and at times becomes pink or light violet. It holds much hypersthene, often in large masses, some a foot across. In several places, pegmatite dykes were seen cutting the rock. The light-violet and pinkish anorthosite, with a medium-grained, granular structure, extends along the other branch of the stream past Cliff Lake, where it rises on both sides of the lake in imposing cliffs capped by bare rounded knobs.

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* See No. 24, Appendix V.

The same rocks are met with, at frequent intervals, along the portage-route, until the second long portage lake is reached, which lies close to a contact between the anorthosite and mica-gneiss. On an island in the middle of the lake, the light-violet anorthosite is cut by large dykes of coarse, white pegmatite. At the outlet the same anorthosite incloses masses of fine-grained, red mica-gneiss, and is itself cut by small pegmatite dykes. The anorthosite has here a gneissic structure and holds a good deal of mica. Strike N. 55° E.

Mica-gneiss.

On the small stream flowing out of the lake, and a mile below the last exposure, medium-grained, red mica-gneiss is seen, and appears to be nearly horizontally bedded. On the first of the three small lakes passed through before reaching the St. John River, there is a coarse, greenish, basic rock, composed of dark plagioclase and mica, that appears to inclose broken bands of red mica-gneiss. On the third lake, dark-violet anorthosite is seen, somewhat foliated. Dip S. 60° W. < 45°-70°.

St. John River.

Rocks chiefly anorthosites.

The next exposure examined was on the St. John River, about a mile below the end of the portage-route. The rock here is a fine-grained, granular, white anorthosite, full of grains of ilmenite and hypersthene. It is somewhat foliated, and strikes S. 10° E. The next exposure is two miles below on the east side, where the rock is coarse-grained, dark-violet in colour and holds large masses of hypersthene. At the next bend, one mile and a half lower down on the west bank, there is a pink and gray, fine-grained mica-gneiss, cut by coarser, red granite dykes. Strike S. 10° E.

Hornblende-gneisses.

As far as the portage twenty-six miles below the last exposures, all the rocks examined were anorthosite, most of it of a light-violet colour, and including masses of the dark, coarsely crystalline variety. In a number of places it is cut by large dykes of red pegmatite. Below the portage the light-violet anorthosite outcrops in many places along the river, to within a short distance of the mouth of the Chambers Branch. Here on the east bank of the main stream, foliated, light-gray gabbro-gneiss is seen. Strike S. 15° E. About 200 yards farther down-stream, on the same side, dark-red, coarse-grained hornblende-granite-gneiss occurs. It is much shattered, and the small cracks are filled with green chlorite. It has all the appearance of an igneous rock and the foliation is probably due to pressure alone. Strike S. 25° E. Unfortunately the contact between these rocks and the anorthosite is concealed, and their relations are consequently unknown.

The coarse hornblende-gneisses outcrop in a number of places along the river, to within ten miles of its mouth, when they pass under the drift which forms the river-banks to its discharge into the Gulf of St. Lawrence.

Manicuagan River.

Gneissic rocks of lower river.

The first rock-exposure examined in ascending the Manicuagan River, was on the north side at the narrows, four miles above its mouth. Here, compact, fine-grained, greenish mica-gneiss is found in low folds, cut by irregular masses of medium-grained hornblende-gneiss, apparently remnants of old squeezed dykes. Red pegmatite veins cut both rocks. General dip N. 65° E. $<$ 10°-50°.

Similar rocks are exposed on the shores and islands to the foot of the first portage, where coarse-textured hornblende-mica-gneiss and hornblende-gneiss prevail, cut by large pegmatite veins. Strike N. 25° E.

At the upper end of the portage, a medium-grained, dark-red mica-gneiss occurs. Strike N. 10° E.; and on the second portage, similar gneiss was also noted, but here it is highly quartzose and passes in places into a quartzite. At the upper end of the portage and on the small islands a couple of miles above, similar rocks occur. Mica-gneisses, cut by much pegmatite, outcrop at intervals up to the third portage, where they are exceedingly quartzose and in places pass into a pure quartzite, which has been waterworn to a smooth porcelain-like surface. Large quartzose pegmatite dykes occur here and cut dark-greenish mica-hornblende-gneiss, and also enclose large angular fragments of the same rock.

Above the third portage, drift covers the rocks in the wide valley, and only a few small exposures are seen for ten miles, to the eastern bend. Red and gray mica-gneisses, often weathering rusty, and cut by a few red pegmatite veins, were seen. Dip N. 10° E. $<$ 60°.

Anorthosite above Toolnustook.

At the bend, the hills surrounding the valley become higher and much bolder in outline, concurrently with the change from the mica-gneisses to a dark greenish gabbro-gneiss and anorthosite. Gabbro-gneiss alone is seen along the river up to about five miles above the junction of the Toolnustook, where it gives place to unfoliated, purple anorthosite. The gabbro-gneiss is usually much weathered on the surface, and has a rusty, greenish colour; it is composed chiefly of plagioclase and mica, with some green hornblende in places.

The unfoliated anorthosite resembles that found along the Romaine and St. John rivers. It is generally of a dark-violet colour, with large crystal-faces, sometimes enclosed in a granular matrix, where the rock has been subjected to crushing. In many places, especially along the gorge at the fourth portage, decomposition has produced in these rocks large irregular masses of saussurite and in other places a gneissic structure is seen where mica and ilmenite are found in thin bands. At the head of the gorge the rocks are well exposed, and are mostly massive anorthosite, with detached patches showing gneissic structure. In places the rock is decomposed to green saussurite. This mineral occurs in irregular masses of varying size, which when large have the inner portion fine-grained, compact, and weathering reddish, while the outer is composed of about half an inch of a dark-green, fibrous, scaly mineral. Several dykes of compact, red pegmatite cut the anorthosite here.

Exposures above Chesniup Portage.

Above the fourth or Chesniup portage, outcrops of anorthosite are frequent in the river-valley for thirteen miles, up to where it again straightens and widens out. The last exposure is of dark-greenish, gabbro-gneiss containing little mica, interbanded with a light-gray, medium-textured, basic gneiss, holding much mica and small garnets, evidently representing rocks near the contact of the anorthosite with the acidic gneisses. Strike N. 50° E.

The country above this place again assumes the character of that underlain by mica-gneisses, and, although no rock-exposures are seen for several miles, from the change in the physical features, it has been assumed that the edge of the anorthosite is close to the last exposure noted.

Up to near the head of the next straight stretch of the river, twenty miles above, no rock is seen in place in the valley. Along the next twenty-four miles, to the portage, several exposures of red and gray, medium-textured, fine-banded mica-gneiss, occur in a few places, interfoliated with medium-grained, red mica-hornblende-augen-gneiss. General strike N. 40° E.

Kikaskuatagan Portage.

Between the fifth and the sixth or Kikaskuatagan Portage, medium to coarse-grained, pink and gray augen-gneiss, often garnetiferous, is seen. Dip N. 50° E. < 20°-70°.

Long Portage.

From the last-named portage to the Long Portage, there are frequent exposures of rock in the valley; coarse, augen-gneiss predominates, and is associated with a few bands of fine-grained mica-gneiss. The augen-gneiss is largely composed of orthoclase, with mica, quartz and at times hornblende. Near the lower end of the Long Portage the strike is N. 25° E. Above the portage, similar coarse augen-gneiss is met with for three miles; it is generally micaceous, but at times carries mica and hornblende.

At and below the next short portage, the coarse augen-gneiss gives place to dark greenish, schistose mica-gneiss, holding small, dark-red garnets and interbanded with a bed of green serpentine-limestone, three feet thick, holding scales of graphite. Immediately above the portage, similar dark mica-gneiss is associated with thin bands of mica-hornblende- and hornblende-schists, some of the bands being highly charged with small garnets. Dip S. 60° E. < 45°. At the next short rapid three miles farther up, schistose mica-gneiss is seen, cut by coarse pegmatite, made up chiefly of purplish-pink orthoclase, with dark-green hornblende, biotite and quartz. Dip S. 70° E. < 60°.

Lake Ichimanicuagen. The perpendicular walls of the deep valley of the river flowing into Lake Ichimanicuagan, afford fine exposures of the rocks, which are seen dipping regularly towards the S. E. < 45°. Several slip faults almost parallel to the dip are seen, as well as others at right-angles to the dip. The rocks are chiefly red mica-gneiss, together with coarse augen-gneiss, which often encloses large lenticular masses of dark schist. Below the first portage on this part of the river, several exposures show dark greenish-gray mica-hornblende-gneiss with thin bands of a red variety. Both are composed largely of a gray orthoclase, mica and decomposed, green hornblende. At the portage, there are bands of red and yellowish, medium-grained mica-hornblende-gneiss, holding some magnetite in small grains, and weathering rusty. Dip S. 75° E. < 20°-45°.

Rocks of Lake Mouchalagan. The next exposure examined is on the west side of Lake Mouchalagan, about two miles north of its outlet. Here the rocks are fine-banded red and gray, garnetiferous mica-hornblende-gneiss, on edge. Strike N. 20° E. These rocks outcrop at several small points on this side of the lake at intervals for the next twelve miles, when coarse-textured, red and gray, garnetiferous mica-gneiss is seen. Strike N. 10° E. On the opposite shore, ten miles above the last exposure, the high rugged hills of the locality approach the shore, and form low cliffs where the lake bends to the east of north. Here a foliated rock is composed wholly of dark green scaly crystals of hornblende and dark red garnets, forming a garnet-diorite. The garnets vary in size from that of small shot to crystals more than an inch in diameter. Interfoliated with this diorite are wide bands of fine-grained, light-gray and pink mica-hornblende-gneiss, also highly garnetiferous. Dip S. 70° E. < 40°. These garnet-diorite rocks are largely developed in the hill behind, where they are easily recognized by their weathering in irregular masses of a rusty colour. They appear to be associated with bands of crystalline limestone.

Garnetiferous gneisses.

At the next point, half a mile farther up the lake, ordinary garnetiferous mica-hornblende-gneiss is seen, and the same rock outcrops two miles beyond at the Partridge-tail Hill on the west side of the lake. The rocks of the first small point beyond, are yellow and reddish-weathering, rotten crystalline limestone and garnet-diorite. The limestone contains many garnets, together with scales of graphite and small quantities of light-green hornblende and mica. The garnet rock is fine-grained and compact; it is composed chiefly of fine-textured hornblende, small garnets and gray plagioclase, and is charged with pyrites. This rock intrudes into and distorts the bands of limestone and garnetiferous mica-gneiss. Crystalline limestones.

At the mouth of the Mouchalagan River, there is a small bluff of light- and dark-gray hornblende-mica-gneiss, holding small scattered garnets and composed chiefly of medium- to coarse-grained hornblende and gray orthoclase, with little mica and quartz. Dip N. 30° E. $<$ 70°. Similar exposures occur along the east bank of the river for two miles above, and in places they are cut by small dykes of red pegmatite. Mouth of Mouchalagan River.

The next exposure of rock is on the west bank, at the foot of the islands above the junction of the Kawikuanapisis River. Here, and at intervals for two miles above, the rocks are chiefly medium-grained gray and pink mica-hornblende-gneiss, the coarse bands sometimes having porphyritic crystals of orthoclase. Associated with these rocks are bands of finer grained pink and light-gray gneiss, holding much mica and quartz and little hornblende or garnet. Dip N. 15° E. $<$ 45°.

For three miles above the islands, upto the small tributary, where the portage past the gorge leaves the river, there is an almost continuous wall of rock on both sides of the valley. On the east side, at the lower end of the cliff, dark and light-gray, well-banded mica-gneiss holding rounded fragments of hornblende-schist, is overlain by ten feet of pyritiferous, schistose mica-gneiss, very much decomposed and holding graphite and garnet. This in turn is overlain by one hundred feet of crystalline limestone interrupted by thin bands of mica-schist. Up along the stream, the lower bands dip below the water, leaving only the limestones and mica-schist exposed in the cliffs. The west bank of the river is nearly all limestone, and if the stream does not run on the line of a fault, there is a great thickness of limestone (more than 1000 feet) developed here. The limestone, in its different bands, varies in colour and purity: the white bands are coarsely crystalline and very pure; the impure bands have a yellowish tinge, due to the presence of small scales of light-brown mica. Small veins of white radiating crystalline tremolite are common, as are also little cavities lined with short light-green crystals of that mineral. Gneisses and crystalline limestone.

Rocks of the gorge.

Immediately above the portage, the gorge is cut out of dark- and light-gray hornblende-granite, with a few pink bands associated with or overlain by dark- and light-gray fine to medium-grained garnetiferous mica-gneisses. Strike N. 80° E.

Line of fault.

At and below the first chute, on the west side, well-banded light-gray highly felspathic mica-gneisses are interbanded with thin layers of garnet-diorite, composed wholly of garnets and dark-green hornblende. These rocks are overlain by bands of limestone twenty and ten feet thick, separated by forty feet of mica-garnet-gneiss. The chute passes over a line of fault, for on the east side of the river where the limestone is well developed, the beds, though greatly crumpled, are nearly flat, above the chute, while below it the limestone and gneiss are on edge. Strike, N. 50° E.

Massive limestones.

At the second chute and above it up to the head of the gorge, the limestones are abundantly developed in bands varying from ten to 200 feet in thickness, but, as they are greatly contorted and faulted, no exact estimate of the total thickness of the beds can be given although they must approximate to 1000 feet if they do not even exceed this thickness. Rotten, rusty-weathered mica-schist always accompanies the limestone bands, usually very pyritiferous, and often carrying much graphite and garnet, while some of the bands contain considerable percentages of magnetite and hæmatite in small grains, with quartz. Veins of white tremolite are common in the limestone ; some of them a foot in thickness, with beautiful radiating needles of that mineral ; other veins of the same radiating mineral are brownish in colour, from iron.

The rocks immediately above the gorge are fine to medium-grained, light to dark-gray mica-hornblende-gneiss, inclosing broken bands and lenticular masses of dark hornblende-garnet-gneiss. Strike S. 75° E. The next exposure occurs on the west bank three miles farther up-stream, where medium to coarse-grained, light-gray, highly hornblendic garnet-gneiss is seen. Strike N. 35° W. Two or three small outcrops of the same rock were seen along shore up to the place at which the portage-route leaves the west shore for Lake Attikopi.

From the portage to the mouth of the Pepechekau River, the rocks are well exposed on both sides of the stream, being almost continuous along the river up to the commencement of the long gorge. They are mostly medium, gray mica-gneiss, together with bands of coarser hornblende-mica-gneiss, often very garnetiferous. Owing to the heavy rapids in the gorge, and the difficulty of landing and examining the nearly perpendicular walls of rock, only a general description of the exposures along this portion of the river can be given. In the gorge above the mouth of the Pepechekau, the rock-exposures on both banks become almost continuous. The structure and association of the various rocks are very complicated, and it would require much work to establish their relations to one another. It would appear that the mica-gneiss and mica-schist, which are most abundant, closely resemble similar rocks on the East Main River, where they in part have been referred to metamorphic clastic rocks of the Huronian. Along the upper part of the gorge, these rocks are found to be cut by various dark-green schists of chlorite and altered hornblende, which correspond closely to the supposed volcanic and ash rocks of the Huronian. All the above rocks in turn are apparently displaced by great masses of generally coarse-textured, pink and gray hornblende-granite, frequently more or less garnetiferous, the mica-gneisses being also often garnetiferous. Great dyke masses, altered to serpentine, are also met with, and in places show stages of alteration, from a coarse diabase. Many of the exposures of chlorite and altered hornblende-schists weather rusty from the decomposition of pyrites, with which they are usually highly charged. They are often cut by quartz-veins, carrying pyrites and crystals of black tourmaline, hornblende and garnets. Towards the head of the gorge, the altered hornblende and chlorite rocks die out, leaving only the schistose mica-gneiss and a few bands of mica-hornblende-schist, both cut by very coarse, highly felspathic hornblende-granite, at times garnetiferous. A short distance above the junction of the Attikopi River, the main stream flows through a large area of hornblende-granite rocks, similar to those found about Nichicun, and probably a south-eastern extension of that great area.

Complicated association of rocks above Pepechekau.

Hornblende granite.

From here to Itomamis Lake, the numerous exposures met with along the stream are all composed of varieties of hornblende-granite that vary in colour from white through pink to red, and in texture from medium-grained to very coarse-grained. Hornblende is always present, and mica in varying quantities nearly always. Orthoclase is the predominant mineral, and quartz is always freely distributed through the mass. These rocks usually show foliation, the strike of which is nearly constant and varies from N. 60° E. to N. 80° E. Segregations of dark-green hornblende-schist are of common occurrence, usually in the form of lenticular masses, at times in strings, so that they appear to have been formed by the stretching and breaking of bands of this rock while inclosed in the granite.

Attikopi River to Itomamis Lake.

Itomamis Lake appears to be situated near the junction of the hornblende-granite mass with a dark-gray garnetiferous mica-gneiss, which

Itomamis Lake.

is seen at the outlet of the lake, and also along the stream leading to Summit Lake. In other places about the shores of the lake only coarse hornblende-granite occurs, often with an augen-gneiss structure. About Summit Lake the rocks are all of the garnetiferous variety. They are usually very quartzose, and often weather rusty. Mica predominates over hornblende, the latter being often absent. Dip N. < 30°-60°.

Portage-route of the Mouchalagan River.

The portage-route to the head-waters of the Mouchalagan leaves the river itself, about twenty-five miles above Lake Mouchalagan, and, passing westward, rapidly rises to the level of the irregular interior plateau. Rock-exposures along the route, though not uncommon, are not nearly as numerous as in the deep river-valley along its rocky walls.

On the summit of the first portage leading from the river, there is a small exposure of dark, rusty-weathering, garnetiferous mica-hornblende-gneiss. Strike N. 10° W. From here to the watershed between the Outardes and Mouchalagan streams no rock is seen in place, but the great number of scattered blocks and boulders show the underlying rock to be chiefly gray mica- and mica-hornblende-gneiss, with some pink hornblende-granite often very coarse in texture.

Little Matonipi Lake.

The next rock seen, was at the entrance to the first small lake above Little Matonipi Lake, where coarse gray and pink mica-gneisses outcrop. Dip S. 50° E. < 20°. On a small island in the same lake, similar gneisses occur in nearly flat beds, cut by much coarse pegmatite. At the end of the portage, on the small stream leading to Little Matonipi Lake, there is a low, sharp ridge of coarse pink, and fine-grained gray, highly quartzose mica-gneiss, cut by pink pegmatite. Dip S. 50° W. 4 < 0°.

Great body of iron ore.

On the shores and the small island adjoining the outlet of the lake, there is a remarkable development of bedded iron ore. The sections exposed give a thickness of over two hundred feet of ore, which varies from a pure mixture of magnetite and hæmatite, to a highly quartzose, ferruginous gneiss. The exceedingly quartzose nature of the gneiss and the quality of the ore, have a certain resemblance to the occurrence of the bedded ores of the Cambrian formation, described under that heading; this would lead to a belief that these ores of the Laurentian may have had a similar origin, and are products of a similar character, more completely altered in conformity with the greater metamorphism of the containing rocks.

The next outcrop of rock noted, was found on the long portage leading northward from Lake Matonipi, where two small exposures of the ore rise above the drift at the summit of the hill. The ore here resembles an ordinary medium-grained highly quartzose gneiss, holding a small amount of garnet and orthoclase, and with magnetite taking the place of mica or hornblende. The direction of the strike here (S. 60° E.) coincides with a line drawn through the last mentioned outcrops, and consequently both probably belong to the same band. The small shining crystal-faces of the ore give to the rock a most brilliant effect in sunlight, so that it sparkles as if studded with diamonds. There is mentioned in the *Relations des Jésuites*, a "burning mountain" situated in Labrador near the head-waters of the Manicuagan River, and information obtained from our guide is to the effect that a shining mountain lies about twenty miles to the westward of the portage and directly on the course of the strike of the iron gneiss. There, a similar sparkling effect is produced by the sunlight, and the "burning mountain" of the missionaries is in all probability a large development of the iron ore in a cliff face. There is no ground whatever for the belief in the existence of an active volcano in this region, based by some writers upon the statements of the *Relations des Jésuites*.

The reported "burning mountain."

Along the course of the portage up the gulley to the watershed between the Outardes and Manicuagan rivers, numerous exposures are seen of light-gray medium-grained, highly felspathic mica-gneiss with many bands of dark mica-schist. General strike N. 40° E.

Rocks near watershed between Manicuagan and Outardes.

Beyond the first stream tributary to the Manicuagan met with on the portage, drift conceals nearly all the rocks of the neighbouring rounded hills for about twelve miles, but, from the loose angular blocks, similar gray mica-gneisses probably prevail to within a short distance of Lake Kichewapistoakan, where hornblende-granite is found in connection with the mica-gneisses, probably forming the south-eastern limit of the great area of such rocks centering about Nichicun.

The high range of mountains on the north side of the south-west branch of the Attikopi River, is probably also formed of this hornblende-granite as outcrops of it occur along that stream on the way to Lake Attikopi. At the first portage in descending, there is dark mica-hornblende-schist, cut by coarse, pink hornblende-gneiss. Strike N. 60° E. Similar coarse hornblende-granite, at times unfoliated, is seen frequently along the shores of Lake Attikopi and down its discharge to its junction with the main stream. On the north-east branch of the Attikopi River, from the larger lake to Attikopis Lake, the mica-gneisses are most prevalent along the lower portion with the granites predominating as the upper lake is approached. A large

Lake Attikopi

dyke of coarse, dark-green diabase was noted above the second portage. It is greatly decomposed and largely changed to serpentine.

Lake Naokokan.

Very few exposures were seen along the route leading from Attikopis Lake to Nichicun, until Lake Naokokan was reached, where hornblende-granite is freely exposed on the shores and islands. About two miles above the last-mentioned lake, outcrops of schistose, garnetiferous mica-gneiss occur at the rapids, where they strike N. 80° E. In the valley above, the scattered blocks and boulders are about equally composed of coarse, red hornblende-granite and gray, garnet-gneiss.

Along the route leading north-east from Attikopis Lake to Summit Lake, different varieties of hornblende-granite alone were met with.

Huronian.

General Remarks.

Character of the rocks.

The rocks included under this system belong both to the sedimentary and to the eruptive classes. The sedimentary rocks are represented by beds of arkose, conglomerate, limestone, shale and slate, sandstone, chert, quartzite, and mica-schist. The eruptive rocks, which were in part, at least, contemporaneous in formation with the sedimentary series, are chiefly basic in composition, and at present are chiefly represented by schists, characterized by chlorite, epidote, altered hornblende, hornblende, sericite and hydromica. There are also massive diabases and diorites; all the rocks are more or less decomposed. The acidic rocks, associated with the above, are mica-granites, mica-hornblende-granites, and hornblende-granites, and perhaps quartz-porphyry. The rocks of the various areas found in Labrador bear a more or less close resemblance to the rocks of other Huronian areas in Canada described by Logan, Bell, Lawson and Barlow in former reports of the Geological Survey.

Two main areas.

Two large areas of Huronian rocks, besides a number of smaller ones, have so far been met with in the Labrador Peninsula. The large areas appear to be confined to the western half of the peninsula, with only a few minor ones in the other half. The largest area is found along the East Main River, where it extends from a few miles above the mouth of the river inland for more than one hundred and sixty miles. In this distance the river generally flows closely parallel to the strike of the rocks. In three places granite-gneiss areas are met with along the stream, where they replace the Huronian rocks. It is impossible to state whether the areas separated by these granite-gneisses are all connected, or form separate wide bands. If, as is probable, they are connected, they constitute a very wide belt, known to be more than twenty miles across the strike where the river cuts it diagonally.

Clastic rocks on East Main River.

The clastic rocks are represented by a mica-schist, which always contains grains of white felspar and at times of quartz. In a number of places these schists change to a conglomerate from the inclusion of rounded pebbles of granite and syenite. The conglomerates are local, and are found in long lenticular masses thinning out at the ends along the strike. At Conglomerate Gorge, several of the lenticular masses of conglomerate are found overlapping each other and separated by bands of the mica-schist. The total thickness of the conglomerate here, including the separating bands of schist, exceeds 400 feet. In other places the conglomerates are not so well developed, and are rarely 100 feet through in the thickest beds. The mica-schists have not been microscopically examined, but macroscopically they are seen to be generally quite distinct from the more highly crystalline Laurentian mica-gneisses, although at times they seem to shade into them. The conglomerates are usually fine, but sometimes hold fragments several tons in weight. All the fragments are well rounded, and in many places they appear to have been flattened and drawn out in the direction of the foliation. By far the greater number of the boulders are composed of fine-textured granite and syenite, with dark basic eruptives less abundantly represented.

In conjunction with a great mass of basic eruptives, a small area of agglomerate was found on the upper part of the river, with the contained fragments composed chiefly of quartzite, jasper, and diorite, altogether different from the conglomerates described above. The matrix is a dark greenish-gray chloritic schist, and is probably derived from altered volcanic ash.

Eruptive rocks.

The eruptives of this area appear to be confined to certain places, where they cut the mica-schists or are interbanded with them. The chlorite-schists, hydromica-schists and some of the hornblende-schists are often interbanded with the mica-schist, and seem to have been formed as ash beds along with them. As has been already stated, bands of these supposed altered ash-rocks were found in association with the garnet mica-gneisses and close to the crystalline limestones of the Laurentian along the Mouchalagan River, and other hornblende-schists are clearly altered dykes, that cut the beds of mica-schist, and probably proceeded from the masses of diabase and diorite that represent the cores of the volcanic eruptions.

The granites are evidently of later age, for they cut all members of the Huronian. The nature of the contact and other details are described further on in the report.

Area south-west of Mistassini.

The other important area of Huronian rocks occupies the basins of the large lakes south-west of Lake Mistassini. To the north-east it runs under the Cambrian limestones, while its south-western limit is unknown, but probably extends for a considerable distance, possibly connecting with the great area of similar rocks known to run eastward beyond the head-waters of the Ottawa River.

Clastic rocks.

In this area the clastic rocks are much better represented than along the East Main River. There is a great thickness of arkose material and agglomerates, with a matrix of chlorite-schist, that is likely an altered volcanic material. The agglomerates are associated with bands of red felsitic schists, formed from the finer detritus of the coarse-textured granitic material that affords the boulders of the agglomerate. The other bedded rocks are quartzite and limestone, the latter being only in thin cherty bands.

Eruptives.

The eruptives are massive diabases and diorites, generally highly altered and chloritic, and in one place changed to serpentine. The volcanic rocks, besides the agglomerates, form thick beds of chloritic and epidotic schists.

A mass of later granite is intruded into the western part of this area, and occupies the greater part of the basin of Lake Obatagoman and the south-western part of Lake Chibougamoo. This area was first examined by Mr. Jas. Richardson in 1870, and only a few changes have been made in his delineation of it.*

Smaller Huronian areas.

Smaller areas of Huronian schists occur on the upper East Main River, in the vicinity of the Sharp Rock Portage and along the small lakes leading from that stream to the head-waters of the Big River.

Hydromica- and hornblende-schists occur along the Koksoak River, for some distance below the last outcrop of Cambrian rock, where they are associated with pegmatites. These rocks may be Huronian. On the upper waters of the Ashuanipi Branch of the Hamilton River, there is a large area, in part or wholly underlain by Huronian schists, but as the outcrops are very few, little is known of the extent and kind of rocks occurring here. A small area of similar rock is met with on the Attikonak Branch at Gabbro Lake, and the strike is such as to lead to the belief that this is an extension of the area just mentioned. Below Birch Lake and at the head of the south-east bay of Michikamau Lake, there is a narrow band of talc-schists, hydromica-schists and chlorite-schists, which may be Huronian.

*Report of Progress, Geol. Surv. Can., 1870-71, pp. 292-294.

Along the east coast of Hudson Bay, areas of Huronian rocks have been described by Dr. R. Bell,* as occurring at Cape Hope and Paint Hills, between the East Main and Big rivers. The rocks are hornblendic, chloritic and epidotic schists, together with mica-schist conglomerates like those found on the East Main River. Farther northward, at Richmond Gulf, there are some thin-bedded quartzites, that underlie unconformably the Cambrian rocks of that region, and are supposed by Dr. Bell to be possibly of Huronian age. On the Great Whale River, a small area of Huronian schists was met with by the writer.† East coast of Hudson Bay.

The large quantity of drift, of undoubted Huronian origin, found about Lake Mistassini, leads to the belief that an area of these rocks will be found to the north-east of that lake. Dark-green schists are reported as occurring in the mountains about the heads of the Outardes and Manicuagan rivers. Area north-east of Mistassini.

Along the Atlantic coast, Dr. Bell‡ reports Huronian rocks about the mouth of Nachvak Bay, and about the Moravian Mission station Ramah, in the next bay south of Nachvak. Atlantic coast.

No other areas of these rocks are known in the Labrador Peninsula, but there is yet every probability that other bands will be found when the country is more fully explored. The occurrence of gold, copper, nickel and pyrites in rocks of this age in other parts of Canada, render the tracing of these areas of great importance. Economic importance.

Lower East Main River.

Twelve miles above the mouth of the East Main River, the Laurentian gneisses and hornblende-granites found on the islands about the mouth of the river, give place to a dark-gray, fine-grained mica-gneiss, often schistose. The mica is arranged in thin layers of small plates, separated from one another by very fine grains of white orthoclase and quartz. This rock closely resembles the rocks met with farther up-stream, where they form a conglomerate holding large boulders of granite and other Laurentian rocks. The mica-schists and fine mica-gneisses often have a porphyritic appearance on weathered surfaces, from the inclusion of large grains of felspar and quartz that are evidently only the coarser particles of the detrital material from which the beds were originally formed. Subsequent folding and pressure have probably changed these sedimentary rocks Schistose mica-gneiss.

*Report of Progress, Geol. Surv. Can., 1877-78, pp. 10 c., 11 c., 15 c.

†Annual Report, Geol. Surv. Can., vol. III. (N.S.), p. 54 J.

‡Report of Progress, Geol. Surv. Can., 1882-84, p. 15 DD.

into their present condition. From their field relations to the Laurentian rocks and also to the irruptive members of the Huronian, there is little doubt that these rocks are the representatives of the sedimentary series of the Huronian, and in places they closely resemble the rocks described by Lawson in the region about Rainy Lake, referred by him there to the Couchiching series, which he supposed to be unconformably below his Keewatin series.* In our hurried examination along the East Main River, no such unconformity was observed. These mica-schists and gneisses, in places contain hornblende along with the mica, and thus grade into a hornblende-schist which is quite distinct from the hornblende-schists produced from eruptive rocks, in that the hornblende is in thin laminæ, separated by the fine-grained white felspar and quartz similar to that in the mica-schists. At the first place where they are seen, they form low outcrops along the north shore of the river for a mile. Some of the bands are somewhat hornblendic. Strike N. 75° E.

Resemblance to Couchiching series.

At the head-of-tide, similar mica-schists are seen, cut by large irregular dykes of white pegmatite. Strike E.

Rocks of Basil Gorge.

Along Basil Gorge, six miles above tide-water, these rocks are again found, associated with large masses of hornblende and chlorite-schists. At the foot of the gorge, the bedded schists are cut by an irregular vein of light-pink, finely crystalline limestone, holding much green hornblende and some sericite. The vein varies in width from eight inches to eight feet and cuts diagonally across the bedding, with an obscure gneissic structure developed in it parallel to the bedding of the surrounding schists, which dip S. 75° E. < 80°. As the gorge is ascended, the mica-schists are found to be cut by large masses of fine-grained, dark-green, altered hornblende-schists and chlorite-schists. Owing to the perpendicular walls of the gorge no detailed examination could be made of the relations of these rocks, but they appear to be similar to those found farther up the stream, and described later on.

Talking Falls.

From the head of Basil Gorge to near the Talking Falls, nine miles above, there is only one small outcrop of mica-schist, on the point between the forks of the river, two miles above the gorge. Everywhere else the river has high steep banks of clay that overlie and conceal the rock beneath. At and below the Talking Falls, a medium-grained gray mica-hornblende-granite is seen, with obscure foliation but with every appearance of being an irruptive rock. The mica is much more abundant than the hornblende, and the whole is likely a post-Huronian intrusion, from which great dykes of white pegmatite

* Annual Report, Geol. Surv. Can., vol. III. (N.S.), pp. 1-196 F.

run off and cut the mica-schists, as seen farther up-stream. At the sharp bend a mile above the falls, and for a mile from there to the foot of a long rapid, very coarse-grained, light-gray mica-hornblende-granite is met with on the islands and shores. From the foot of the rapid to its head, for nearly two miles, the northern shore is formed of rock. Along the lower portion of this stretch the dark mica-schists are seen to be cut by great dykes of white pegmatite. This pegmatite is exceedingly coarse, and, embedded in the white orthoclase, are large masses of that mineral having a light-bluish colour. There are also large plates of light-green muscovite scattered through the mass, but they are generally too much crushed and broken to be of value. Quartz in large masses is also present, along with large crystals of black tourmaline. Near the dykes the mica-schists are in many places much disturbed and twisted. As the stream is ascended, the dykes, which run generally parallel to the bedding, become smaller and fewer.

About half-way up the rapid, a large pegmatite dyke cuts off great angular masses of the mica-schist, which here dips N. 65° W. < 60°. Near the contact the schist appears to be more siliceous and approaches an impure quartzite. Half a mile from the head of the rapid, the schist is found to include several beds of fine conglomerate from nine to fifteen inches thick. The pebbles are all derived from medium to fine-grained red and gray granite. At the head of the rapid the rock is a rusty mica-schist, charged with partly decomposed pyrites and cut by thin dykes of fine-grained hornblende-schist that run almost parallel to the bedding of the mica-schists.

Conglomerates.

At the Island Fall, two miles farther up the stream, the mica-schists again outcrop, striking N. 85° E. For six miles above, the banks of the river are cut out of stratified clays and sands, and no rock is seen in place up to the foot of the rapids that extend for three miles below Clouston Gorge. Along both shores, up to the foot of the gorge, mica-schists are seen at frequent intervals rising from beneath the stratified drift. There is a continuous exposure of rock from the head of this gorge to the rapids below it. The mica-schists are now associated with irruptives in the form of large masses of medium to fine-textured diorite of a dark-green colour. In some of the coarser grained rock there is a beautiful secondary arrangement of hornblende in small radiating masses of crystals. These diorites seem to be intimately connected with bands of dark-green altered hornblende-schists and chlorite-schists, which appear to have originally formed dykes cutting the bedded rocks now represented by the mica-schists, their present schistose structure being due to subsequent pressure. This would also account for the breaking and apparent inclusion of

Island Fall.

Clouston gorge.

Altered dykes.

fragments of these chloritic-schists in the mica-gneisses. The large masses of diorite cut the mica schists and gneisses. The latter rocks, near the contacts with the diorites, are apparently more highly altered than elsewhere, as they then occur either as true mica-schists or as crystalline, fine-grained mica-gneiss. The strike is also disturbed, and all the phenomena of the contact point to an intrusion of the diorites and their associated dykes into the bedded series, previous to the final folding of the latter.

Great diabase dyke

Above Clouston Gorge, the banks of the river again become low, and are formed of stratified drift up to within a short distance of the next rocky defile, called Conglomerate Gorge, twenty-two miles farther up-stream. The only rock seen between these places is a low boss on the south shore, eight miles above the lower gorge. This low hill is formed of medium-grained, dark-green diabase, and is probably part of a great dyke similar to others of a like nature that are found everywhere throughout Labrador, where they cut the rocks of all the formations, including the Cambrian. This mass is over one hundred yards wide, but as its borders are not seen, its total width is unknown. About a mile below the mouth of Conglomerate Gorge, there is a small exposure of medium-grained mica-hornblende-gneiss, that has the aspect of a Laurentian rock, but the exposure is so small that it is hardly possible to say what the age of this rock may be.

Conglomerate Gorge.

Conglomerate Gorge is three miles long, and the channel and shores are rocky throughout, but as the strike is almost parallel to the direction of the gorge, no great thickness of strata is exposed. At the lower end of the gorge, mica-schist is seen interbanded with green chlorite-schists, which appear to be either old dykes or altered pyroclastic beds. Both series are cut by a dyke of medium-grained, dark-green diabase, holding a considerable amount of pyrites in small grains. The dyke is about one hundred feet wide and its direction is N. 10° W. The schists on the east side of the dyke strike N. 50° E., while those on the west side strike N. 30° E., showing a disturbance due to the intrusion. The wall-rock is also considerably altered near the dyke. For half a mile between the dyke and the lower fall, the mica-schists are highly charged with pyrites, and are separated from the green chlorite-schists by fifty feet of light yellow slate.

Mica-schists and conglomerates.

Between the chutes, the rock is all mica-schist holding small lenticular masses of a coarse conglomerate. A small dyke of fine-textured, dark-green diabase, nine inches wide, was observed here, being probably a branch from the main dyke already noted.

From the upper chute to the head of the gorge, a distance of more than a mile and a half, only mica-schist and conglomerate are seen. The conglomerate occurs, as before, in heavy lenticular beds, and the total thickness of these must be at least 400 feet. The fragments in the conglomerate range from large pebbles to boulders two feet in diameter. Fully nine-tenths of them consist of a medium-grained, pink granite that closely resembles the rock of a granite area passed through farther up the river. The remainder of the pebbles are made up of a fine-grained, rusty-weathering diorite, light-bluish quartzite, and medium-grained gray mica-hornblende-gneiss, the last being very rare. Above Conglomerate Gorge, the river makes a sharp reversed curve in the next three miles, and the several small rock exposures along it are of mica-schist, with an occasional bed of conglomerate. At the upper end of the bend, there is a small chute where the last conglomerate bands are seen. The matrix is mica-schist and is at times charged with pyrites, and some bands of the schist hold small, dark-red garnets.

Last conglomerate.

Mica-schists.

Mica-schist outcrops frequently along both shores of the river for the next twenty-five miles, up to the mouth of the Wabamisk River, but, as the strike of the rocks is roughly parallel to the direction of the river, only a comparatively small cross-section is displayed. Five miles above the last conglomerate mentioned, a dyke of dark-green diabase of medium texture and holding masses of light-green huronite and a large amount of pyrites, crosses the bedding of the schists. This dyke is seventy-five feet wide, and its direction is N. 75° W., or nearly parallel to the other large dyke seen at Conglomerate Gorge. Several small dykes of the same kind occur a short distance farther down stream, and differ from the larger only in that their texture is finer.

Huronite.

Wabamisk River.

At the mouth of the Wabamisk River, the bedded series of mica-schists is replaced by hornblende-schists chlorite-schists and altered diorites. On the north bank half a mile above this branch, the chlorite-schists are highly charged with pyrites, which for 100 feet along the strike is found in an almost pure bed ten feet thick. The surface of this ore is much oxidized and changed to brown limonite. On analysis only traces of gold were found in the pyrites.

Bed of pyrites.

Frequent exposures of green chlorite- and sericite-schists, are met with on the small islands and shores for the next two miles up the stream, where there is a contact between the altered hornblende-schists and a fine-grained, schistose mica-gneiss. The hornblende-schist cuts it sharply, and is itself somewhat altered for several inches from the contact. The hornblende-schist encloses fragments of the gneiss that at times have their foliation transverse to that of the schists. Here also is seen a soft, green steatite rock, holding fragments of boulders of dark green, altered hornblende-gneiss also cut by the green hornblende-schists.

Aquatako River.

At the mouth of the Aquatako River, green chlorite-schists are again seen, charged with pyrites and cut by a vein of calcite nine inches wide. For the next ten miles up-stream, frequent exposures of dark-green altered hornblendic and chloritic schists occur on the shores and islands, the squeezed products of altered diabase, diorite and quartz-porphyry.* Along the upper three miles of this stretch, the exposures of schist are mixed with others of fine- to medium-grained, white mica-hornblende-gneiss. Where the contact between these rocks is seen, the green schists cut the gneisses, and often inclose masses of them, showing that the schists have been eruptive rocks in the gneisses. These gneisses † bear a close resemblance to the majority of the boulders found in the conglomerates already described, and may represent the source from which they have been derived. They now occur along the river-banks for twenty miles, with a total absence of the hornblende-schists, until the lower end of the Great Bend is passed, when the schists and associated diorite rock are again met with. The total width of the band here, including the inclosed bands and masses of gneiss, is slightly less than one mile across the strike, which runs N. 70° E.

Probable source of boulders in conglomerates.

Altered dykes.

Below the whirlpool, the bands of fine-grained hornblende-schist are thin, and the hornblende-granite predominates. At the whirlpool there is a thick band of dark-green, fine-grained, uralitic gabbro,‡ which abuts against a light-pink mica-hornblende gneiss of medium-texture and this latter is interbanded with green hornblende-schists. A close examination proves that the latter are altered dykes, probably connected with the gabbro masses in the vicinity. These dykes, as a rule, run parallel to the foliation of the gneiss, but are found in places to cross it, and also to branch, and again unite, thus inclosing large masses of the gneiss. The foliation of the dykes is constant in direction with that of the gneiss, and when the dyke is not parallel with the gneiss, the foliation is found to be transverse to that of the dyke.

Near the contact the mica-hornblende-gneiss has a hardened appearance, its texture is finer, and numerous small cracks are filled with light green chlorite. The geology here is further complicated by the presence of a number of small dykes of dark-green, fine-textured diabase, which cut all the other rocks. These small dykes show the faulted condition of the rocks they pass through, as at every few feet

* See Nos. 5, 25, 30, Appendix V.

† See No. 21, Appendix V.

‡ See No. 2, Appendix V.

along their course they are broken, with a throw of six to twelve inches at each fault.

Above the whirlpool, for a mile along the south shore, the rocks seen are all thin-banded, fine-grained, light-gray mica-schists and dark-green hornblende-schists. Strike N. 85° E.

Border of the Huronian.

The Laurentian gneisses again come in above, and the Huronian rocks are not met with along the river for twenty-one miles, up to a point two miles below the mouth of the Broken Paddle River, where the Huronian irruptives are again found cutting the Laurentian gneisses.

Area characterized by eruptions.

This area of Huronian extends along the river for twelve miles, but as the strike is nearly parallel to the course of the stream, the breadth of the band (if the strike can be taken to represent anything but foliation induced by pressure) is not greater than three miles. The rocks here are all, or nearly all, of volcanic and igneous origin; and they are so intricately associated that little information could be obtained in regard to their relative positions in the necessarily hurried examinations made. The irruptive rocks have to a great extent been rendered schistose by pressure and have been much altered, so that diorites and diabase look alike and are hardly distinguishable under the microscope. From the field relations there appears to have been an older intrusion of diorite, together with volcanic outbursts, resulting in the formation of tuffaceous agglomerates and shales. These in turn appear to have been cut by masses of gabbro and their accompanying diabase dykes. The gabbro masses and dykes have a much older appearance and are more decomposed than the heavy dykes of diabase met with farther down the river, probably belonging to an older period than these.

Near Broken Paddle River.

The first contact with the gneisses is on the north shore, two miles below the mouth of the Broken Paddle River, where the rock is probably the remains of a great diorite dyke, now altered to a dark-green amphibolite, holding angular fragments of a fine-grained mica-gneiss, which is seen to be sharply cut on the west side. On a small island, just below the mouth of the river, five dykes of dark-green altered diabase or diorite cut the gneisses almost in the direction of the strike, which is here east. On the shore opposite the island, light-gray and pink mica-gneiss is seen, a good deal contorted. Strike S. 75° E. The next exposure is opposite the mouth of the small river, where the pink and gray mica-gneiss is in contact with a dark-green, coarsely crystalline diabase, holding crystals of light-green plagioclase. The diabase is fine-grained near the contact and abruptly cuts the gneiss, also entering cracks and irregularities in it.

Altered diorites and hornblende schists.

No rocks are seen above for a mile and a half, to an island on the south side, where a light-gray, compact, altered diorite of fine texture, containing much disseminated pyrites in small grains, is associated with a compact dark-green, altered trap, and dark-green hornblende-schist. Above this island on the opposite shore, the altered diorite is seen sharply cutting the mica-gneiss, while a few small schistose bands of hornblende penetrate the gneisses along the strike and a larger dyke from the diorite cuts them transversely. Similar contacts are seen on both sides of the river in the next mile, after which the Laurentian gneisses do not appear.

Agglomerate band.

These altered diorites and hornblende-schists continue for more than a mile, when, on the south shore, a band of agglomerate is encountered, which appears to be nearly 300 feet thick, including an intrusion of diorite fifty feet wide. This agglomerate in its western extension appears to pass into a schistose, basic, arkose material full of large rounded grains of quartz. The matrix of the agglomerate is a dark-green and grayish schist,* and the boulders and pebbles are all, or nearly all, well rounded, and flattened or pulled out parallel to the bedding or foliation. The largest boulders are fifteen inches long and twelve inches thick. The greater number are composed of gray quartzite, having at times a pinkish or green tinge. Along with these are a few boulders of dark-red jasper, and a light-green diabase. To the eastward, the conglomerate also passes into grauwacke holding large grains of quartz.

Squeezed clastic rocks.

For the next mile, up to a low chute, the rocks are massive altered diorite and chlorite-schists. Above the chute, there is a considerable thickness of mica-schist, similar to the bedded rock associated with the irruptives, at the places already noted on the lower parts of the river. These mica-schists are associated with a fine-grained, highly siliceous, dark-gray schist, that holds small pebbles of quartzite and fine-textured granite, and is probably a squeezed conglomerate. They are cut by bands of hornblende-schist, and there is a large band of altered diabase† on an island. A mile above the chute, dark green chlorite-schists and altered hornblende-schists are seen, containing narrow quartz-veins that hold small quantities of copper-pyrites.

For six miles above the last-mentioned exposure, there is a constant jumble of chlorite-, sericite- and altered hornblende schists, along with massive altered eruptives,‡ and small areas of a dark-gray quartzite holding scales of mica, and perhaps representing the bedded series. The eastern contact between the Huronian and Laurentian rocks is not

* See No. 28, Appendix V.

† See No. 31, Appendix V.

‡ See Nos. 10, 16, 17, Appendix V.

seen on the river, there being an interval of five miles between the upper exposure of the former and the next outcrop of gneiss.

Prosper and Ross gorges.

The next area of hornblende-schists, hornblende-mica- and mica-schists is found between the Prosper and Ross gorges, over fifty miles farther up the stream. These rocks here form a belt less than a mile wide, and are cut by large masses of pink pegmatite. The schists are more gneissic and less decomposed than those previously noted, and there is an absence of the altered diorite and diabase masses commonly found with them. They probably represent only altered schistose dykes, due to the Huronian period, with perhaps some of the micaceous bands of that formation. Taken altogether, they have an older, more metamorphic appearance than any of the Huronian areas previously described, and until further evidence is forthcoming cannot well be separated from the general Laurentian mass.

Huronian Area South-west of Lake Mistassini.

Clastic and eruptive rocks.

Extending from the south-west end of Lake Mistassini to and probably beyond Lake Obatagoman, some sixty miles to the south-west, there is an area of Huronian rocks out of which the basins of Wakwanichi and Chibougamoo lakes have been excavated. The rocks found in a hurried examination along the shores of the lakes, and on the portages between them, show that there is here developed a series of altered hornblendic and chloritic schists, agglomerates and serpentines, probably formed by the alteration of basic eruptives, and associated with volcanic ash rocks. A clastic series is also represented with the eruptives, consisting of thick beds of arkose conglomerate or agglomerate, felspathic schists, with dark chert limestone.

Deposits of iron- and copper-pyrites.

A mass of true granite appears to have been injected along the south-west margin of the area, subsequent to the formation of the basic series. Altogether, this area is worthy of a much more detailed examination than could be afforded by a trip through it to a field of work beyond, and it may prove interesting and important mineralogically, as well as geologically, on account of the rich deposits of iron- and copper-pyrites, seen in several places near the contact of the chlorite-schists with the granite and altered diabases. In this respect the deposits of ore are much like the nickel-bearing deposits of the Sudbury district, and on more extended investigation it is not improbable that such deposits might be found in this region, although assays of the pyrites from here have not given any nickel or have given only a trace of this metal.

Rocks of Lake Obatagoman.

The examination of these rocks was made along the route leading from the head of the Chamouchouan River, north-east to Lake Mistassini. On crossing the watershed, Lake Obatagoman, the first of three large lakes, is entered. The route passes northward through this lake between myriads of small granite islands, to a deep, narrow bay leading north-east, with a portage-route to Lake Chibougamoo. Along the shores of this bay dark-green chlorite-schists and massive dark-green altered diabase* of fine texture are met with. Strike S. 70° E.

On the first portage, a light grayish-green altered eruptive† is found, with schistose felspathic rocks holding many greenish and purplish flattened concretions, which on weathered surfaces show concentric lines. Similar felsitic schists are met with on the second portage, where the concretions are less numerous and the beds are cut by many small quartz-veins, holding chlorite and epidote, and associated with a massive, fine-grained chlorite rock.

Lake Chibougamoo.

The next exposures are along the west shore of Lake Chibougamoo and the adjacent islands, where a probable extension of the granite area is seen. On the small islands; about two miles off the mouth of the narrows, compact, dark-green diorite is cut by small dykes of light-green diabase of fine texture. Along the north-west shore of the lake, just before reaching Paint Mountain, green chlorite rock is seen, weathering to a grayish-green, and holding considerable quantities of magnetite in disseminated grains. At the foot of the mountain the rock is a green chlorite-schist, holding specks of copper- and iron-pyrites. On the south side of the mountain there is a contact between a large mass of coarse, white hornblende-granite and the compact and schistose chlorite rocks. At and near the contact these measures are much broken, and the cracks and cavities are highly charged with iron-pyrites, in a zone extending twenty feet from the contact. The chlorite rocks are penetrated by many small veins of quartz holding epidote.

Vicinity of Paint Mountain.

Iron-pyrites.

Along the east side of Paint Mountain, leading to the discharge of the lake, the schists are again seen, together with a diorite mass nearly 200 yards wide, and followed again by green schists to the northward. Near the southern contact there is a dark-green vein or dyke several yards wide running into the mountain, highly charged with pyrites. On the south side of the narrows, the green schists with pyrites are again met with. In the narrows, there are several exposures in a couple of miles, of what appears to be a volcanic conglomerate or agglomerate. The matrix is a dark-green schistose chlorite, evidently an altered ash.

Conglomerate.

* See No. 15, Appendix V. † See No. 14, Appendix V.

and it appears to have filled up the interstices between masses of Laurentian débris, and by subsequent folding and pressure it has been rendered schistose and decomposed to chlorite. The material forming the pebbles and boulders of the conglomerate is, nearly all, more or less rounded fragments of Laurentian granite, generally red in colour and coarse in texture, and varying in size from small grains to masses several tons in weight. A number of larger boulders consist of pink and grayish-green hornblende-granite, much finer in texture than the red granites, and many of them are somewhat decomposed and slightly impregnated with chlorite. An impure quartzite forms a few of the masses, and there are some pebbles of red jasper and of a fine-grained siliceous chlorite rock. Large boulders.

Where the fragments are small in size, the amount of the green chlorite mixture is not great, owing to there being less space to fill between the particles, and to the difficulty with which the supposed ash would fill these cavities in a large mass of such fine material. Where the boulders are large, the dark-green schist greatly predominates, and the rock finally passes from a conglomerate into a chlorite-schist, in which boulders are absent. Character of matrix.

The small islands at the head of the north-east bay, close to the first portage landing to Lake Wahwanichi, are formed of gray, compact diabase, composed chiefly of dark-gray plagioclase, and holding small crystals of greenish-white plagioclase. Two hundred yards to the west of the commencement of the portage, there is a conical hill of dark-green serpentine, on the top of which, Mr. Richardson found a band of blackish limestone, about a foot thick, interstratified with the serpentine. A sliced portion of the limestone under the microscope revealed a structure resembling that of some coral.* According to T. Sterry Hunt† the serpentines contain much disseminated magnetic iron, that yields on analysis a considerable percentage of chromium and traces of nickel. Serpentine.

On the portages and small lakes between Chibougamoo and Wahwanichi, light and dark chloritic and felsitic schists only are seen. Along the south-east shore of Wahwanichi Lake, no rock-exposures occur to within six miles of its outlet, where green chlorite-schist and squeezed arkose bands again outcrop, on edge. The arkose rock appears to be in places an agglomerate with a schistose paste, holding masses of coarse, red, very felspathic granite. Where the beds are finer grained, they are formed chiefly of grains of red orthoclase, with some quartz. The folding and pressure has induced a schistose Arkose rocks.

* Report of Progress, Geol. Surv. Can., 1870-71, p. 294. † Ibid.

structure in the finest beds, so that they are now an impure felsite-schist.

Richardson on rocks of Wahwanichi Lake.

According to Richardson*:—"On the north-west side of the lake, about the middle, these rocks rise to a height of 150 to 200 feet, forming a bare escarpment extending for about four miles; and, on the same side, near the outlet, Wahwanichi Mountain, which is entirely composed of them, rises about 350 feet, for the most part bare and rocky, and extending along the margin of the lake for nearly three miles. The fragments in the conglomerates in the last two localities are chiefly of Laurentian rocks, and the enclosed masses are often many tons in weight. In some places, without close examination, the conglomerate might be mistaken for a Laurentian gneiss. In many parts of this hill considerable exposures of red shale are met with, as well as gray and chocolate-brown sandstones, made up of fine grains of reddish felspar and white quartz."

At the portage past the chute at the outlet of the lake, a small exposure of light-gray, impure chert, holding grains of quartz and flecked with spots of brownish dolomite, is seen associated with dark-gray chert, holding occasional large grains of quartz and small pebbles of gneiss.

Relations of Huronian with Cambrian of Mistassini.

At the second portage, at the south-west end of Lake Mistassini, there is a small outcrop of the green schistose agglomerate. Beyond this only large angular blocks of dark-gray cherty limestone are seen —belonging to the almost flat-bedded series of Cambrian rocks of the Lake Mistassini basin. These last-mentioned rocks appear to rest unconformably on the tilted-up series of agglomerates, schists and cherts, but this is not here established by an actual contact, as the nearest outcrop seen of the flat-bedded limestones is fully ten miles away from the Huronian rocks. A more detailed examination of the region about the south-western portion of Mistassini must be undertaken, before any definite statement of the actual relations of the two series can be made, except that on the Perch River, which empties into the west side of the south-west bay of Mistassini, the limestones are found resting directly on the Laurentian gneiss, and here either cover the tilted series to the south-west unconformably or overlap them; the former being probably the case.

Large area of post-Huronian granite.

Lake Obatagoman occupies a shallow basin in a large area of granite similar to that already described along the East Main River, which from its cutting the Huronian schists can be distinctly referred to

*Report of Progress, Geol. Surv. Can., 1870-71, p. 294.

as irruptive. This area of granite appears to extend north-east so as to occupy the southern part of Lake Chibougamoo, giving a known length of twenty miles, with a breadth of eight miles. Except where it is seen close to the dark chlorite-schists, on the northern shores of Lake Obatagoman, there are no signs of foliation in the mass, which elsewhere has all the appearance of being of an irruptive origin. The granite, as seen on the islands and points of the last-named lake, is usually of medium texture and always of a light yellowish-gray colour, due to the colour of the contained orthoclase. Quartz is usually very abundant, and mica occurs in fine plates. Hornblende appears to be always associated with the mica, but usually in small quantities. Where seen on Lake Chibougamoo, the granite is coarser and very felspathic, with little quartz, mica and hornblende. It is penetrated by little veins of pyrites, and also by small dykes of white pegmatite. At Paint Mountain on the west side of the narrows, the granite is very coarse in texture, and is almost wholly formed of white orthoclase with green hornblende and little or no quartz, becoming a syenite. This granite cuts the dark-green chlorite-schists that make up the mass of the mountain, and the pyrites found in them is especially abundant in the granite zone within twenty feet of the contact.

This area of granite bears a close resemblance to the granite mass met with about the Talking Falls on the East Main River, where the granite undoubtedly cuts rock of Huronian age.

CAMBRIAN.

General character and thickness.

The series of rocks classified as Cambrian, comprises beds of arkose rock, sandstone, chert, limestone, dolomite, felsitic shale, argillite, and argillaceous shale, together with gabbro, diabase, fine-grained decomposed traps and volcanic agglomerates. No acid eruptives, such as quartz-porphyry, were found.

The sedimentary deposits have a minimum thickness of about 2500 feet, and may have a much greater thickness, which can be determined only by close study of the areas along the Koksoak and Hamilton rivers, where a series of step or overthrust faults cause frequent repetitions of the different members, rendering it exceedingly difficult to determine the total thickness of the measures by means of observations made along a couple of lines of hurried exploration.

General section.

The following section is a rough estimate of the succession and probable thickness of the sedimentary rocks along the Koksoak River in descending order :—

	Feet.
1. Rusty-weathering, black, micaceous shales........	600
2. Dark-gray, ferruginous cherts.................. ...	200
3. Dark-gray, ferruginous cherts, together with beds of jasper and magnetite....	500
4. Fine-grained, dark-gray, ferruginous chert, somewhat calcareous and blotched with siderite	150
5. Light-pink, very compact, brecciated limestone, often very siliceous......	20
6. Light-green siliceous shales	30
7. Black, carbonaceous, graphitic shales.............	100
8. Massive, cherty, dark-blue dolomite...	10
9. Pearly-green shales, with cherty dolomite beds, showing ripple marks.	40
10. Coarse, gray sandstone......	3
11. Greenish-gray, calcareous shale, with occasional bands (6 in. to 15 in.) of fine-grained, dark-blue dolomite, weathering yellow..................	30
12. Fragmental, violet pink, calcareous chert.........	200
13. Red calcareous sandrock...........	200
14. Medium-grained red-sandstone, and thin beds of red felsitic shales...............................	10
15. Bands of red and gray sandstone, separated by beds of red felsitic shales...........	425
	2518

Remarks on section.

This section is constructed from several broken sections taken along the river. No. 15 rests unconformably upon Laurentian granite. No. 14 represents the lowest beds of another cliff-face, and perhaps may be the upper part of No. 15.

There is a break in the section between No. 11 and No. 12, with probably a few beds missing. From No. 4 to No. 11 the section is continuous, while the upper measures are added by estimation, from the various exposures seen along the river, and are only an approximation of the thickness of the iron-bearing cherts, shales and limestones.

Correlation of the rocks.

On account of the great distances dividing the respective developments, it is impossible to correlate these rocks directly with those of Lake Superior or Newfoundland, which are supposed to represent the same geological period. The only rocks with which they closely agree are found along the east coast of Hudson Bay, which have been called by Dr. R. Bell,* the Manitounuck and Nastapoka groups. These he correlates with the Nipigon series, the equivalents of the Keweenawan of Lake Superior. From an examination of the various sections given by Dr. Bell, and a comparison of the hand specimens, there appears to be a closer agreement between the rocks of Hudson Bay and the Animikie formation of Lake Superior, which underlies the Keweenawan rocks.

*Report of Progress, Geol. Surv. Can., 1877-78, pp. 11c-20c.

The correlation of the rocks of Central Labrador with those of Newfoundland is difficult owing to the lack of specimens from the latter place. There appears to be considerable resemblance between the section above, and that given by Sir Wm. Logan,† of the rocks along the Labrador shore of the Strait of Belle Isle and the northern part of Newfoundland. The fossils found in these rocks are of Lower Cambrian age. Unfortunately no fossils have been found in the supposed Cambrian rocks of the interior of Labrador or those of Hudson Bay, and until such are found their precise age and equivalency can only be conjectured on lithological grounds.

No fossils found.

Whatever their precise age may be, there must have been a great lapse of time between the deposition of the Huronian rocks and the main period of deformation and folding to which these, in common with the aggregation of rocks classed as Laurentian, were subjected, and the deposit of these later strata, which rest uncomfortably upon both of the older formations. This period of time was sufficient to permit not only the levelling down and removal of great masses of the contorted older formations, but also to allow the sculpturing of the main existing features of the peninsula upon the surface thus formed, including, in part at least, the erosion of the great valley of the Hamilton River and Inlet. In this excavation beds of sandstone identical with the lower beds of the Koksoak and upper Hamilton rivers, and of Lake Michikamau, are found resting horizontally in the valley of the inlet and river, at or near the present water-level. The great basins of Mistassini and Michikamau lakes were also formed previous to the deposition of these sandstones and limestones; and along the shores of these lakes and in other places, where the contact between the older and newer rocks is seen, the gneisses and schists present the same rounded hummocks so characteristic of the uncovered and subsequently glaciated Laurentian and Huronian hills of many parts of northern Canada. In many places the overlying rocks rest undisturbed upon the rounded surfaces, but in other localities they show signs of having been shoved over them.

Evidence of great denudation between Archæan and Cambrian.

When the amount of denudation and erosion implied is considered, and also the length of time required to cut deep valleys out of Archæan granites and gneisses, where the excavation since the glacial period is practically nothing, it must be admitted that the interval between the deposition of the Laurentian and Huronian strata and that of the rocks classed as Cambrian, marks one of the greatest breaks known in geological time.

† Geology of Canada, 1863, pp. 865-67.

Rocks of Koksoak and Hamilton rivers probably connected.

The greatest development of this series is found along the Koksoak and upper Hamilton rivers. From the direction of the strike of the areas, it is highly probable that they are portions of a single great belt that extends from the neighbourhood of latitude 54° N. to beyond the Koksoak River, and continues in a north-north-west direction to Hopes Advance, on the east side of Ungava Bay, from where specimens of similar rocks were brought to Fort Chimo by the Eskimo. The total length would in this case be more than 400 miles. The breadth of this band where examined is about fifty miles. Both on the Koksoak and Hamilton rivers the strata are inclined towards the north-east or north-north-east, at angles varying from ten to eighty degrees. A number of parallel step-faults, with heavy throws, cause a series of repetitions of the various members of the formation. On the Koksoak River, below the junction of the Stillwater River, the hills on the north side of the stream show sixteen of these faults in a distance of twenty miles. Above the Stillwater, the repetitions of measures from this cause are numerous, but their extent and number were not determined. On the upper Hamilton River, where the whole series is well developed, the same step-faults were noticed, and are there marked by the sharp ridges so characteristic of the country underlain by these rocks. The ridges are cut off abruptly on their western faces, while their eastern slopes agree with the dip of the underlying rocks.

Numerous parallel faults.

At Lake Mistassini, where only the cherty limestones are found, similar faults have been noticed, the direction of the thrust there being from east-south-east towards west-north-west. On the east coast of Hudson Bay, at least one line of fault, and perhaps two or more may be observed, so that the rocks now dip seaward at moderately high angles. The coast is fringed with a chain of islands of the newer rocks, and these islands have abrupt faces towards the land, and slope towards the bay at the same angle as the inclination of the beds. The sections observed in the rocks of the islands are in part similar to those on the mainland, and are evidently a repetition caused by an overthrust similar to those met with on the Koksoak River. The thick strata of sandstone, chert and limestone appear to have resisted flexure, under a pressure exerted from the direction of the sea, on both sides of the Labrador Peninsula, and instead of folding they have faulted and have been thrown into a series of steps. The shales, where well developed, have been folded as well as faulted.

East coast of Hudson Bay.

These rocks along the east coast of Hudson Bay, as before stated, form only a narrow fringe on the mainland, and include the islands a short distance off the coast. They extend from Cape Jones northward for three hundred miles to Cape Dufferin.

The basin of Lake Michikamau is occupied by an outlier of Cambrian rocks, which may connect with the main area of the Koksoak River. Only the lower sandstones and limestones are found here, generally horizontal, but resting at a high angle against the granite hills near the discharge of the lake. Lake Michikamau.

In the neighbourhood of Lake Mistassini, the cherty limestones only are found, covering an area one hundred miles long and about twenty-five broad. Small patches of arkose sandstone and conglomerate were met with on the Hamilton River about forty miles above its mouth, and similar rocks were found, flat-bedded, along the low shores of Hamilton Inlet, about Milligan Bay. Lake Mistassini.

Dr. A. S. Packard* mentions as occurring along the Labrador coast from Domino Harbour to Cape Webuc, for a distance of 125 miles, a "development" of "domino gneiss" occupying depressions in the Laurention gneiss, on which it rests uncomformably, generally dipping at low angles. From his description of these rocks, they appear to be arkose conglomerate and sandstone beds, similar to those seen on Hamilton Inlet, and may represent the basal beds of the Cambrian, although Dr. Packard believes them to be of Pre-Cambrian age. "Domino gneiss."

The igneous rocks of this series, as far as seen, all appear to be basic in composition, and include gabbro and diabase in the form of great masses or large dykes, as the deep-seated irruptives, with finer-grained greenstones, which occur as bedded traps and are generally so much decomposed that they show only chlorite in the microscopic sections. These trap-flows, in the interior regions, are always found interbedded with the clastic rocks. Many of the large diabase dykes or sills also conform with the bedding planes, and only by following the outcrops can they be found jogging from one plane to another. On the east coast of Hudson Bay some of the traps have formed overflows on the surface, and are now represented by dark-green, fine-grained melaphyres, having large amygdaloidal cavities filled with quartz and agate. Similar overflows of trap also occur on the Atlantic coast at Chateau Bay, near the eastern entrance of the Strait of Belle Isle, where the trap rests directly on Laurentian gneisses without any of the bedded clastic rocks. Cambrian igneous rocks.

The mode of occurrence of thick beds of magnetic iron ore overlain by cherty, non-fragmental carbonates in this series, closely resembles that of the iron ores of the Lake Superior region described by Irving, Van Hise† and others. This, with other characters of resemblance, renders it almost certain that the two Iron ores.

* The Labrador Coast. Hodges, New York, 1891, pp. 286-290.
† U.S. Geol. Surv., Monograph XIX.

developments represent the same period, or, in other words, that the Animikie rocks of Lake Superior, assumed to be Lower Cambrian, are equivalent to the rocks here described as Cambrian in Labrador. There must have been at this time a wide-spread subsidence of the Archæan of north-eastern America.*

Lake Mistassini Area.

Cambrian of Lake Mistassini.

The great basin in the Archæan rocks at present partly filled by the Mistassini lakes, appears to have existed as such at a very remote period, previous to the deposition of the Cambrian limestones that are now found forming the shores and islands of the lakes. The area at present occupied by these limestones, stretches from the south-west end of Lake Mistassini, to a short distance beyond the north-east end of the lakes, about one hundred miles. The greatest breadth of the area is not much over twenty-five miles.

Its limits.

Along the north-west side of Mistassini, the limestone is found on the points and numerous small islands that fringe the shore, while the deeper bays are cut out of Laurentian gneiss. In many places the limestone is seen resting uncomformably on bosses of gneiss, that to all appearance had the same rounded outline as the uncovered and recently glaciated surrounding hills. The north-east limit appears to extend about three or four miles beyond the head of Lake Mistassini, to the foot of a high range of hills that crosses the end of the lake. Beyond the north end of Little Mistassini, there is a low area probably underlain by this formation, that extends a short distance up the Temiscamie River, until the gneiss is met with. The south-eastern boundary is beyond the Temiscamie River, which flows parallel to Little Mistassini Lake, and is separated from it by a narrow limestone ridge. The south-western boundary does not appear to pass beyond Mistassini Lake, where the rocks are cut off by the sharp hills of the Huronian area.

Thickness.

The total thickness of the limestones remaining, probably does not exceed three or four hundred feet, and across the strike there are probably repetitions caused by faults parallel to the strike, like those seen along the Koksoak and Hamilton rivers. The first line of fault, met with in passing from north-west to south-east, is in the middle of Lake Mistassini, and has produced the long points at the ends of the lake and the chain of islands between them. The western sides of the points and islands have abrupt escarpments, with deep water close in to their shores.

*Compare Annual Report, Geol. Surv. Can., vol. II. (N.S.), p. 8 R.

The rocks are also considerably contorted and broken for some distance away from the line of fault. The second line of fault is indicated by the escarpment that divides the two lakes, and a third fault forms another ridge along the south-east side of Little Mistassini and divides the lake from the Temiscamie River. Besides these three principal lines of fault, there appear to be several minor ones that produce lines of low islands along the south-east shore of the great lake as well as in the smaller lake. Except where disturbed, close to the lines of fault, the limestones dip towards the south-east at angles that vary only from four to ten degrees from the horizontal. Faults.

The lowest beds, resting on the gneisses along the north-west side of Lake Mistassini, consist of a dark bluish-gray limestone of medium-grained crystalline texture, and hold irregular concretionary masses of black chert and thin veins and bands of the same material, along with thin bands of black shaly limestone. Above these are thin beds of light-blue, fine-grained, siliceous, dolomitic limestone, that weather to a light buff and are interbedded with thin layers of a grayish, coarse, gritty limestone, containing large quantities of small rounded grains of transparent quartz. Resting on these are beds of light-blue, very compact limestone, exceedingly hard and breaking with a conchoidal fracture. These are followed in ascending order by thinner beds of the same character, interbedded with coarse-gray, siliceous limestones full of grit. Succession of beds.

As before stated, the beds close to the lines of fault are much contorted and broken, and in many places have been greatly shattered and re-cemented with either calcite or quartz, most often the latter, which give the rock a brecciated appearance, and cause it at times to resemble a conglomerate. At the end of the south-west point of the larger lake, where the rock is disturbed and jointed, the small veins of calcite hold little globules of the bright black bituminous mineral "anthraxolite"* or altered bitumen, probably gathered from the surrounding limestones, some of which are quite dark and carbonaceous. Along the portage between Great and Little Mistassini, the limestones are again contorted and broken, and appear to be more altered than elsewhere. The light-gray dolomitic variety is most abundant here, and is finely crystalline and brecciated, the limestone filling the cracks being pink in colour. All are very siliceous, and at times pass into an impure quartzite. On the islands in the smaller lake, the dark bands containing small grains of transparent quartz are most abundant. Disturbance and fracture.

There is a marked resemblance between these limestones and those found along the Koksoak and Hamilton rivers. The resemblance is Rocks like those of other areas.

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*See Annual Report, Geol. Surv., Can., vol. VII. (N.S.), p. 66 R.

so great, that from the hand specimens in the office, almost any rock from the one locality can be duplicated from either of the other localities, and when they are mixed together, it is impossible to distinguish them. The same remarks apply to the limestones found along the east coast of Hudson Bay, from Cape Jones northward to beyond Great Whale River.

Koksoak River Area.

Cambrian of Koksoak River.

At Cambrian Lake, about 150 miles above the mouth of the Koksoak River, the west side of the probable northern extension of the Hamilton River area is first seen. The first exposure occurs on the west shore of the lake, five miles below the mouth of the Death River, where the measures form a low cliff and dip N. 10° W. < 100, or at a small angle to the direction of the shore. The section displayed, in descending or natural order, is as follows :—

	Feet.
1. Brecciated, purplish, calcareous sand-rock..........	100
2. Banded, red and gray sand-rock, consisting of grains of quartz with a calcareous matrix	200
3. Ferruginous red argillite.....................	10
4. Medium-grained, red sand-rock and red argillite.....	—

The lowest measures are concealed and broken, but from appearances there must be at least 300 feet of red calcareous sand-rock, with partings of red argillite, and some beds of green siliceous argillite holding a good deal of pyrites in cubes. A bay with low shores separates this section from the next exposure, a mile and a half away, but as the second exposure is nearly on the strike of the first there can only be a small break in the series. This second exposure is half a mile long, and gives the following section in descending order :—

Sections on Cambrian Lake.

	Feet.
1. Fine-grained red ferruginous chert; containing small blotches of carbonate of iron.....................	150
2. Light-pink, very compact brecciated limestone, containing a considerable quantity of silica...........	20
3. Light-green, siliceous argillite......................	30
4. Blackish graphitic shales....................	100
5. Blue dolomite, somewhat cherty....	10
6. Pearly, green shales, showing ripple marks and parted by thin beds of dolomite........................	40
7. Coarse gray sandstone....	3
8. Greenish-gray, calcareous shale and dark-green argillaceous limestone, with occasional beds of fine-grained, dark-blue, yellow-weathering dolomite (6 inches to 15 inches thick)......	30
Total.......	383

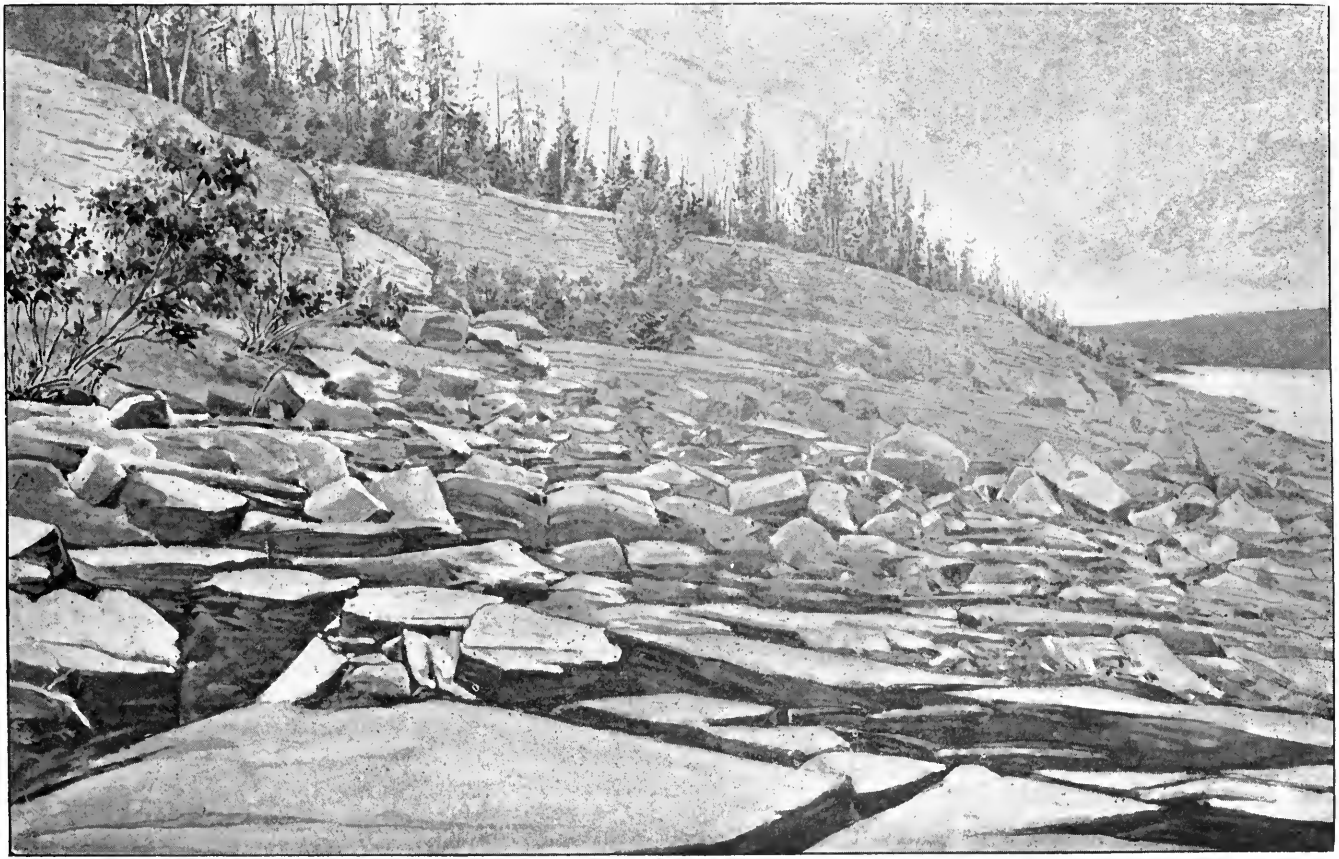

Photo. by A. P. Low, 1894.

BEDDED SANDSTONES AND SHALES, CAMBRIAN LAKE, KOKSOAK RIVER.

The shore is now drift-covered for one mile, and then forms a low cliff for two miles, but as the strike of the rocks nearly coincides with the shore-line no great thickness of beds is seen. The section probably repeats the last, with the addition of some 200 feet of argillaceous limestone and black shales on top.

The next outcrop occurs at a high point on the same side of the lake and five miles northward of the last. Here the Cambrian strata rest unconformably on a boss of hornblende-granite, dipping E. < 70.

The following is a descending section of the beds which probably are the lowest of the series :—

	Feet.
1. Red sandstone	4
2. Red argillite	3
3. Red sandstone	5
4. Red argillite	4
5. Red sandstone	10
6. Red argillite	6
7. Red sandstone	3
8. Red argillite	5
9. Red sandstone	2
10. Red argillite	25
11. Red sandstone	2
12. Red argillite	8
13. Red sandstone	2
14. Red argillite	4
15. Gray sandstone	3
16. Red argillite	5
17. Red and gray sandstone	15
18. Red argillite	40
19. Gray sandstone	2
20. Red argillite	3
21. Red sandstone	8
22. Red argillite	6
23. Red sandstone	8
24. Red argillite	9
25. Red sandstone	30
26. Red argillite	4
27. Red sandstone	2
28. Red argillite	9
29. Red sandstone	4
30. Red argillite	2
31. Red sandstone	3
32. Red argillite	40
33. Red sandstone	5
34. Red argillite	20
35. Gray and red sandstone	60
36. Red argillite	2
37. Coarse, grayish-pink, arkose sandrock	10
38. Concealed, to granite	50
Total	423

The Cambrian rocks are not again seen on the shores of the lake, but cap the high hills on both sides. On the north-west side they are coarse, pinkish-gray sandstone, while on the south-east side red sandstones, rusty-weathering shales and limestones predominate.

River below Cambrian Lake.

The Laurentian hornblende-granite forms two low hills close to the water, the first being on the east side at the point where the lake changes direction from north to north-east, the second is on the north side three miles lower down where the lake again gradually narrows and shallows into the river. For ten miles below the second outcrop of granite, the river banks are low and sandy, until a small exposure is reached on the south bank, of fine-grained, dark green graywacke* composed chiefly of minute fragments of felspar and closely resembling a fine-grained trap, especially on weathered surfaces. This rock is very compact, and exceedingly tough. On a hill near by, the same rock was found capping a high cliff, with argillaceous limestone and black shales beneath it. Dip S. 80° W. $<$ 30°.

Rocks at Shale Chute.

At the Shale Chute there are 500 feet of dark, greenish-gray shale, on edge, along with a few thin bands of light greenish-gray argillaceous limestone. On the south bank immediately below this chute, and for some distance further down, the rocks outcrop in a narrow band between the water and the overlying drift, giving a small section of very cherty, ferruginous limestone, holding thin bands of buff-weathering, pinkish siderite. These rocks are overlain by twenty feet of dark-blue, cherty limestone, containing nests of siderite.

Iron ores and jasper.

Two miles below Shale Chute, there is a large exposure of bedded iron ore (a mixture of magnetite and hæmatite) about twenty-five feet thick, underlain by ten feet of highly ferruginous cherty limestone, with spathic ore in small spots and masses scattered through it. The magnetic ores are interstratified with thin bands of red jasper varying in colour from crimson to vermilion; these bands are of unequal thickness, and sometimes they are broken into lenticular masses. The thickest is about three inches, but they are usually less than one inch through. The next exposure is on the west bank, three miles and a half farther down stream than the last, where a dark-gray, compact chert holds angular fragments of cherty limestone and siderite, both weathering yellow, and all cut by many small quartz-veins. On the same bank half a mile lower down stream, fifty feet of red siliceous shale and jasper are overlain by 200 feet of jaspery magnetite; the shale holds many small red garnets, while the jasper bands are always less than six inches thick. In the next half-mile 400 feet of red jasper

* See No. 9, Appendix V.

and magnetite are overlain by fifty feet of dark-gray, cherty rock containing masses of carbonate of iron. The jasper bands vary from half an inch to eight inches in thickness; the magnetites are mostly impure and shaly.

On the north shore, opposite the mouth of Swampy-bay River, 100 feet of dark-gray, argillaceous limestone are overlain by 400 feet of dark shales, both nearly on edge. Strike N. 15° W. Rocks at Swampy-bay River.

At a heavy rapid, two miles above the Swampy-bay River, there is a large exposure of jasper banded with brownish-gray spathic ore. The jasper is olive-green in colour, and often has angular fragments of red jasper scattered through it, from the fracturing of thin red bands and the filling of the cracks with the green variety. This rock would take a high polish and make a beautiful ornamental stone.

A mile below Swampy-bay River, there is an entire hill of dark-blue, cherty, ferruginous limestone holding large patches of siderite throughout. Along with the limestone are a few bands of jasper. These rocks are continuously exposed for a mile along the river, then follow two miles of drift-formed banks with rusty-weathering, black shales and argillaceous limestones in a greatly disturbed condition.

The river-valley for the next thirteen miles is wider, and only occasional exposures of shale and limestone rise from beneath the drift. Along this distance, down-stream, the limestones gradually take the place of the shales, and at the lower end of the stretch only thin beds of greenish-gray shale are seen at the base of the overlying magnesian limestone. For the next following twelve miles, to the Pyrites Chute, almost constant exposures of limestone occur along the river-banks. This limestone is almost identical with that found at Lake Mistassini and along the east coast of Hudson Bay. It is generally light-blue in colour, very siliceous, breaking into sharp, angular fragments, exceedingly fine in texture where free from grains of quartz, which are found in some of the beds. The rock has been much disturbed, being thrown into sharp folds and faulted into a series of sharp, parallel ridges of hills. The faulting and shattering has broken many of the beds of limestone into angular fragments which have been cemented again with calcareous matter into a sort of breccia. The whole, after being re-cemented, must again have been fractured, when the last cracks were filled with quartz-veins, that now penetrate the mass of rock in all directions. Limestones replacing shales down-stream.

At the Pyrites Chute the black shales are again met with; at the head of the chute they include a few beds of fine-grained, black limestone. The bedding is greatly contorted into small domes, that dip Rocks at Pyrites Chute.

steeply in all directions About half way down the chute the beds are more regular, and dip away from domes of light-weathering limestone on which they rest. The transition from limestone to black shale is made in about fifteen feet, through a light-gray, argillaceous limestone, that gradually changes to light, pearly shale, and this again to the dark variety. The black shales and limestones are all highly charged with pyrites, usually occurring as separate cubes, but sometimes in large masses.

Below the chute on the east side of the river, the low hills have rusty cliffs, and are probably formed of shale.

At Limestone Fall

The light-blue magnesian limestones are again seen on the islands above the Limestone Fall, where they are less distributed. At the fall the river descends sixty feet over ledges of limestone. The rock is of a light-blue colour, somewhat siliceous, and brecciated by numerous small veins of quartz that cut it in all directions. A few thin beds of pearly-gray, calcareous shale are interbedded with the limestone. Dip N. 75° E. < 40°.

Black shales at Manitou Gorge.

No rock is seen in the valley from this fall to the head of the Manitou Gorge, four miles farther down-stream, where the river has cut a long, narrow channel out of the shales and limestones. At the head of the gorge, large exposures of black shales are found, with a very regular dip N. 75° E. < 50°. They continue down the east side of the gorge, and were examined for over a mile. Where their edges have been polished in the channel, their colour is green. Pyrites in cubes is scattered in considerable quantities through the shales. A number of thin beds of light-gray pearly shale are enclosed among the black beds. Numerous small veins of quartz penetrate the shales; they are usually barren, but sometimes carry pyrites, and in one place a small quantity of galena was observed.

Junction of limestones and shales.

At the lower end of the portage, on the east bank, the shales overlie limestone; as the junction is approached, the shales change from black to pearly-gray, becoming somewhat siliceous and having interbedded thin bands of limestones which gradually become more numerous and thicker until they finally altogether displace the shales. The bands enclosed in the shales are very siliceous, and some of them pass into quartzite. Some of these quartzite bands are white, others yellowish, and others again have a purple colour. The limestones extend half a mile below the foot of the gorge, the beds gradually becoming flatter.

Rocks below Stillwater.

Four miles below the gorge, or a mile above the mouth of Stillwater River, there is on the east bank a large exposure of light-blue, fine-grained, siliceous limestone. Dip N. 70° E. < 10°. Below this river the valley widens out, and the river-banks are low and sandy, only two rock exposures being seen in seventeen miles. These exposures are respectively three and a half and eight miles below the Stillwater. They consist of well-rounded bosses rising above the drift. The rock at both places is nearly identical, and is a medium-grained, light-green, much altered diorite* holding much whitish plagioclase, with specks of pyrite. The diorites are directly on the strike of the capping rock of the sharp hills that bound the valley on the north side. The hills run in sharp ridges parallel to the strike of the rocks, and have perpendicular faces towards the west, while the slope on the opposite side is quite gentle (10°-20°). The cliff-faces of the ridges are all very similar in appearance; a thick cap of compact rock, perhaps bedded diorite generally overhanging the rocks below, which are rusty-weathering, black shales from 300 feet to 400 feet thick, with limestone forming a steep slope at the bottom. The two upper members of the series are seen in every cliff, the lower one being sometimes concealed, either by being covered with débris, or owing to the lower part of the hill not rising above the east slope of the adjoining ridge. The ridges are from a quarter of a mile to two miles apart, and sixteen of them were counted in a distance of twenty miles down the stream. Each of the cliff-faces of the ridges practically repeats, in a more or less complete form, the section given in the others. This, in itself, appears to be sufficient reason to assume that the beds are again and again repeated by faults, otherwise the total thickness of the rocks would be enormous, and the uniformity of repetition of members wholly improbable.

Numerous similar ridges.

Twenty miles below the mouth of the Stillwater, the Laurentian gneisses again rise from beneath the Cambrian, and the latter rocks are confined to the summits of the hills, from which they gradually disappear as the river is further descended.

North edge of the Cambrian.

Hamilton River Area.

The rocks of the great area of Cambrian on the Ashuanipi Branch of the Hamilton River, were first seen on a number of low islands in the small lake-expansion six miles below the outlet of Birch Lake. The beds here are impure sandstone or graywacke, made up of irregular grains of quartz and red orthoclase cemented together with silica. These beds have evidently been formed from the detritus of the gneisses on which they rest. They dip W. $< 40°$.

Cambrian on Ashuanipi Branch.

Along the river to the outlet of Birch Lake, the banks are formed of drift deposits, and no rock is seen in place. On the low islands

Outcrops on Birch Lake.

* See No. 23, Appendix V.

extending westward from the outlet of the lake and dividing it into two deep bays on the north side of the outlet, there are large quantities of black shale, with thin bands of dark argillaceous limestone evidently broken up in place by the ice. On the south shore, at the entrance to the south bay, is a low bluff of dark-greenish very siliceous limestone, holding small quantities of pyrite and having little irregular veins from two to four inches wide of siderite and calcite. The veins run generally parallel to the bedding which dips S. 45° W. < 80°. The rock has also two sets of cleavage-planes—one vertical and at right-angles to the true dip, and the other dipping N. 60° W. < 45°. On the sharp ridge on the south side of the lake, near its southern inlet, a similar dark siliceous and ferruginous limestone is seen forming the crest of the hill. For three miles up the southern inlet, the only rocks observed were small exposures of a similar limestone, very much fractured and dipping west at a high angle. From the angular blocks scattered about, it is evident that these rocks hold large quantities of carbonate of iron, present as segregations or concretions in the limestone.

The river here becomes obstructed by many small islands, that divide it into numerous channels for the next seven miles to where it flows out of Dyke Lake. These islands appear to be all formed of bedded black shale. Just above the heavy rapid at the outlet of Dyke Lake, there is a rocky ridge extending along the north side. The rocks here are very complicated, bedded siliceous limestones being interbanded with volcanic ash rocks and eruptives and also with a jasper conglomerate. The rocks dip S. 80° W. 70, and the section exposed is as follows:—

Section on Dyke Lake.

40 feet of jasper conglomerate. The jasper is present generally in the form of small water-worn pebbles, but is at times angular, with a few larger pebbles of ferruginous red quartzite. The matrix is a dark-green schistose chlorite. In places where the jasper pebbles are small and numerous, it would appear that all the interstices had not been filled in with the ashy material, and that the pebbles were subsequently cemented together by infiltrations of white quartz.

20 feet of dark greenish compact rock, occasionally holding small amygdules, filled with calcite. This rock is quite ferruginous, distinctly bedded, and is probably a volcanic-ash rock.*

10 feet of brownish, porous rock, highly siliceous and distinctly clastic, probably another ash rock.

5 feet of compact, finely crystalline magnetite, coloured by a small admixture of red hæmatite.

* See No. 1, Appendix V.

10 feet of brownish trap rock.
5 feet of bedded magnetite.
20 feet of brownish trap rock.

The cherty volcanic-ash rocks come out along the lake shore for about three miles above the rapid, where they appear to be backed on the hill behind by a large mass of dark-green, fine-grained diabase,* that is much decomposed on the surface.

Fault Hill and vicinity.

On the summit of Fault Hill, at the end of the long point between the northern and southern discharges of Dyke Lake, a medium-grained, dark diabase† is seen, while on the southern flanks of the hill a brownish, fine-grained, highly siliceous shale is met with in broken masses, containing much carbonate of iron. Fault Hill derives its name from the great fracture which traverses it from south-east to north-west, in consequence of which the western portion rises abruptly over 100 feet above the adjoining eastern end.

On the south shore of the lake, opposite Fault Hill, and continuing from there northward some three miles, light greenish-gray shales are seen, along with thin beds of dark-blue cherty rock of a fine texture, often holding small grains of quartz. At times this rock is highly pyritous, and it often holds small yellow patches of siderite. These rocks are all on edge, and strike S. 60° E.

On the large island on the north side of the main channel, four miles north of Fault Hill, low exposures of light-green argillite interbedded with light-gray sand-rock, occur for more than a mile along shore. The argillites show ripple-marks, and in places are somewhat slickensided. All the beds are penetrated by numerous small quartz-veins.

At the point of the next large island to the north, where it adjoins the eastern shore, are twenty feet of light-gray sand-rock, often coarse-grained, and interbedded with thin bands of cherty limestones. These rocks are greatly cut up by small reticulated quartz-veins. Strike S. 30° E.

Great iabase dyke.

On the mainland just above, there is a large mass of light-green diabase,‡ generally quite coarse in texture, except on the north side, where it becomes fine-grained near its contact with the sand-rock, and causes the reticulated structure in the latter. The diabase often contains large porphyritic crystals of huronite and also specks of pyrite and pyrrhotite. This rock is in the form of a great dyke that stretches northward along the west shore of the lake for eight miles, to the narrows leading to Lake Petitsikapau. The direction of the

* See No. 22, Appendix V. † See No. 33, Appendix V. ‡ See No. 34, Appendix V.

dyke is such that, if continued, it would pass through Fault Hill, and the diabase found there points to such a southern extension. The dyke appears to form all the points along the west side of the lake. At one of these, a mile to the northward of the last-described exposure, the dyke is 200 yards wide and its contacts with the bedded series are well seen. The direction of the dyke is nearly parallel to the bedding, but it jogs occasionally from one bed to another. The west wall is formed of light-gray sand-rock, apparently baked at the contact, and full of small quartz-veins, which usually extend only a few feet from the contact. On the east side, black shales form the wall-rock, and near the contact they are changed to a light-green argillite. The diabase continues to be seen on the points, as above described, while in the bays between are black shales with occasional beds of black argillaceous limestone. The shales at times weather rusty from the decomposition of the pyrites contained in them.

Entrance to Lake Petitsikapau,

On the east side of the entrance to the narrows leading to Lake Petitsikapau, there is another contact between the diabase dyke and the black shales and limestones. As before, the dyke runs mainly parallel to the bedding, but is seen in one place to jog four feet, and in another eight inches. The shales and limestones are hardened near the contact, and are of a light, grayish-green colour, owing to the contained carbon having been burnt out. They are cut by small quartz-veins that extend from eight to ten feet from the dyke, and then die out. The shales are tilted up at high angles and strike N. 50° W.

On the western point, at the narrows, a bed of fine granular magnetite, twenty feet wide, is seen extending along the shore for 200 feet. Like all other beds of this kind, the iron ore is associated with red jasper in broken angular masses, scattered in bands through the ore. The appearance of the jasper leads to the belief that it originally formed beds, varying from a quarter of an inch to six inches in thickness, which have been subsequently broken by folding and pressure, so as to assume their present appearance. The beds are on edge and the strike is N. 30° W. On the west side these beds are followed by 200 feet of dark cherty rock, with a brownish fracture, and containing a considerable percentage of carbonate of iron. These rocks contain in some places a few small pebbles of quartzite, and in others irregular masses of apple-green chert.

At the upper end of the narrows, the rock seen is a dark, shaly, siliceous limestone, holding a considerable quantity of iron. Strike W. These shaly, ferruginous rocks are met with along the west sides of the first deep northern bay of Lake Petitsikapau where their strike coincides closely with the trend of the shores.

Along the shores of the other northern bays and on all the low islands in the lake, rock is seen everywhere. In the northern bays limestone predominates, and is accompanied by shale. On the islands the latter is most plentiful, and in places has a perpendicular cleavage. Where the limestone is in thick beds, it has a dark bluish-gray colour and a medium-grained crystalline texture. In many places it includes angular masses of a very fine-grained, black carbonaceous limestone. Some of the beds hold small grains of quartz, and closely resemble similar beds at Lake Mistassini. These rocks are all much fractured, and are tilted up at high angles with evidence of numerous faults. Where the shales predominate, the rocks of the limestone bands are finer-grained and more carbonaceous. The shales are nearly always black, and sometimes bituminous; rarely, bands of a lighter green colour are met with, more especially where limestone is plentiful. Rocks of Lake Petitsikapau.

Scattered amongst the broken shale and limestone, on two islands near the mouth of the north-east bay, a number of blocks of a black carbon mineral were observed. The largest blocks measured eight inches in thickness, and, from the white vein-quartz attached to their sides, it is obvious that the mineral occurs either in veins or pockets. It has a foliated appearance, with plates arranged at right-angles to the walls. In colour it is black with a high lustre, resembling graphite. A more detailed description of this material is given under the heading of economic minerals.

On the summit of a range of hills along the east side of the lake, were found bedded limestones and ferruginous cherts, tilted up at a high angle, with their strike parallel to the direction of the hill, or N. 20° W. A small dyke of fine-grained diabase* cuts these rocks. In places on the western side of the summit, the rocks appear not to have been glaciated, and are much decomposed on the surface. The limestone is here represented by a residual, impure, black oxide of iron, and the small quartz-veins that penetrate it stand out from six to eight inches above the general mass. East side of the lake.

Leaving Lake Petitsikapau, and returning to Dyke Lake along the west shore, to the northward of the inlet of the river we find a long exposure of brown-weathering, shaly limestone, and ferruginous chert. Strike N. 60° W. At the inlet of the river, the stream is broken into heavy rapids, as it passes over ledges and between small islands formed by a great dyke, that here crosses the stream and continues N. 30° W., along the east shore of the next lake-expansion above, for Great diabase dyke.

* See No. 20, Appendix V.

more than five miles. This dyke is over 300 yards wide, and only its eastern contact with the bedded series is seen. The rock forming the dyke is medium-grained, dark-green diabase, holding in places light-green crystals of plagioclase. Near the contact, the rock is much finer in texture and darker-coloured. Dark-blue, medium-grained limestone is found on the east side of the dyke, where the beds dip N. 40° E. < 80°, or away from the dyke. For twelve feet from the contact, the limestone has a baked appearance, its colour being lighter, and the bedding marked by different shades; its texture also appears finer, and it is very hard, brittle and cherty. The dyke runs parallel to the strike, but jogs from bed to bed, in one place crossing about twenty feet.

On the west side of the lake there is only one small exposure of shaly limestone. At the south-west angle, where the river flows in, another great dyke of diabase is met with, and its contact with the cherty limestone is seen. At the contact the limestone is baked, intensely fractured and re-cemented. The diabase near the contact is of a strongly developed porphyritic character.* The dyke is seen passing southward for a mile along the river, when it is covered with drift.

Rocks of Astray Lake.

In Astray Lake two chains of low, rocky islands and reefs extend several miles down the centre of the lake. These are all composed of a compact, light-blue limestone, very fine in texture, cherty, and greatly fractured, the small cracks being filled with quartz, which gives a finely reticulated appearance to weathered surfaces. Large irregular masses of black chert are scattered through it. The rocks weather yellowish-white, with some brown bands. These limestones are identical in appearance with those of Lake Mistassini and those of the Koksoak River at and below the Limestone Fall.

Iron area.

Near the head of the middle northern bay of Astray Lake, on its west shore, a low hill, 150 feet high, of bedded jaspery iron ore is seen; dip S. 50° E. < 20°. The ore is a fine-grained magnetite, with patches of red hæmatite, and holds broken bands of red jasper. Some of the beds more than fifteen inches thick are of pure ore without any jasper. The ore-beds are overlain by the buff-weathering, blue limestones, holding black chert, and are greatly shattered and re-cemented by quartz. These limestones come out in great thickness on a high island about a mile to the south-east. On the west shore, a large dyke of fine-grained, dark-green diabase follows the shore, from behind the island, southward for upwards of a mile. This dyke forms a low escarpment, and its contact with the bedded rocks was not seen.

* See No. 3, Appendix V.

On the north-east bay ledges of buff-weathering limestone are seen along the west shore and on the large islands. On the east side, three miles from the head of this bay, is an escarpment of 120 feet, cut out of black shales and thin beds of limestone; dip, N. 40° E. $<$ 45°–60°. Between this escarpment and fifty feet of jaspery iron ore, exposed on a small point, is an interval of 200 feet concealed by drift. The ore-beds contain much jasper and are not very rich in iron.

The west shore of Astray Lake is low and drift-covered as far south as Quartz Hill, which rises in a sharp cone close to the shore between the lake and the river leading to Menihek Lake. The top of the hill is bare, and the rock is a white-weathering, light-gray and green quartzite, holding angular fragments of blue-banded flint that are evidently the remains of broken beds of that material. The beds are on edge, and the strike is N. 30° W. Quartz Hill.

On the long narrow island in Astray Lake, a low rocky escarpment extends for more than three miles along its eastern side. The rocks forming the escarpment are very fine-grained, compact, light-gray and pink cherts, much fractured, and overlain by a very siliceous buff-weathering limestone that dips N. 50° E. $<$ 35°. There are frequent outcrops of buff-weathering cherty limestone along the west shore of Astray Lake for five miles, to the small rapid leading to Marble Lake. The strike of the limestone is parallel to the shore, and only a small section is exposed. The dip is N. 50° E. The same buff limestones form low cliffs at intervals along the east shore of Marble Lake for three miles from its outlet, and also appear on the west shore at its north end. On the eastern side of the river there are many loose blocks of dark-green trap, holding angular masses of red jasper. Limestones and cherts.

At the first heavy rapid, where the river turns westward towards Menihek Lake, the rock is nearly horizontal, and lies in low flat domes. It is a well-banded, very dark gray siliceous trap, and resembles an altered compact ash. The same flat-bedded traps are seen at the small fall some three miles below the lower Menihek Lake, where they are full of small specks of pyrites arranged in bands. At the outlet of the lake there are many large loose blocks of alternately bedded jasper and magnetite. These blocks evidently show the condition of the bedded ores when undisturbed, the jasper being in continuous layers from one-half to three inches thick, and not in angular fragments scattered through the ore, as seen where the beds have been tilted and crushed. Route to Menihek Lake.

The shores of Menihek Lake are generally low and formed of drift, so that very few rock-exposures are seen. No outcrops occur on the Rocks of Menihek.

east side of the lake, and only three on the west side. The first noted is on a long point, four miles south of the outlet. Here the rock is not seen in place, but in fragments heaped up by the ice in a mound of large angular blocks. These blocks show a rusty-weathering, coarsely crystalline, siliceous limestone, containing a large percentage of small rounded grains of quartz, and at times containing large pebbles of dark chert, as well as irregular chert masses. Small veins of calcite penetrate the rock and hold globular masses of a brilliant black carbon, probably of the same nature as the "anthraxolite" of Lake Petitsikapau and of Lake Mistassini.

Anthraxolite.

Chert and siderite.

Ten miles to the south, where a small stream enters the lake from the westward, there is an exposure a quarter of a mile long, of flat-bedded dark-gray chert, much broken, and weathering a dark brown. The rock is blotched with siderite, often altered to an earthy limonite. The ore-masses vary from half an inch to two or three feet in diameter, and also occur as thin beds of irregular thickness. The total thickness seen is about forty feet, and the rock is everywhere split up into angular blocks, that are scattered about, giving the exposure the appearance of a dump at a mine.

The last exposure of rock on the Menihek Lake, is at the mouth of the large western branch, twelve miles farther southward. On the south bank of this stream, there is an outcrop of fifteen feet of similar ferruginous chert. From here southward for twenty miles, to the head of the lakes, although no rocks are seen in place, the numerous angular blocks of chert scattered about everywhere, with the continuous similarity in character of the country, lead to the belief that the Cambrian rocks continue underlying the drift to the entrance of the river, where the surface changes in aspect and loose blocks of Huronian schists replace those of chert.

Lake Michikamau.

Rocks on Lake Michikamau.

The basin occupied by Lake Michikamau seems to have been cut out of the lower beds of the Cambrian series, and the area of these rocks here may be connected with the main mass to the north of Lake Petitsikapau, as the wide valley partly occupied by Lake Michikamau extends far beyond the north end of the lake towards the main area.

Lowest beds of the Cambrian.

Although there are only a few places about the lake where the Cambrian rocks are seen in place, there is no doubt but that these rocks are everywhere present in the bottom of the lake, and that the loose angular masses of sandstone which are very abundant in many places along the shores, have been shoved by the ice out of the water into their present position. Only the lowest beds of the Cambrian series are met with, consisting of red conglomerate and red sandstone, with a few beds of limestone above them. On the west side of the lake, from the south end northward to the beginning of the anorthosite area, the shores are low and all the points are thickly strewn with angular blocks of red sandstone. This sandstone varies in texture from fine to coarse, and some of it is mottled with light-pink and green blotches. Such blocks are much more numerous than the gneissic boulders found along with them. The north end of the lake is low and the shores are formed chiefly of sand; the scattered boulders are mostly large and consist of Archæan rocks, these being much more abundant than the Cambrian sandstones. Southward along the eastern side, the blocks of sandstone are not numerous on the sandy shores until the anorthosite rocks have been passed, when they again become plentiful.

Eight miles north of the outlet of the lake, the low granite hills along the shore, and the numerous small islands, are almost completely covered by large blocks of sandstone and light bluish cherty limestone. These blocks continue numerous until the hill on the north side of the discharge is reached, where patches of bluish-gray limestone are seen resting on the sides of the granite hill, and along the base of the hill thin beds of red sandstone rest at a high angle against the granite. Beds nea outlet.

To the south of the outlet of the lake the shores are again low and sandy. As the south end of the main body of the lake is approached, huge blocks of coarse sandstone and fine conglomerate are seen on the low shore and islands.

The conglomerate probably represents the lowest beds of the series. Its matrix is a coarse sandstone, or more properly grauwacke, as it contains many small angular fragments of orthoclase, intermixed with the quartz grains. The pebbles of the conglomerate are mostly small, but are occasionally as much as nine inches in diameter. They are composed almost wholly of various kinds of hornblende-granite, mostly fine-grained, along with a few white quartzite pebbles, no anorthosite pebbles being seen. The conglomerate passes into a coarse red sandstone, and the latter, becoming fine-grained, passes into a very siliceous limestone, of a light bluish-gray or pink colour. The limestone is often greatly contorted, and at times the weathering of the finely bedded and highly contorted rock presents the appearance of organic structure similar to that of *Stromatopera*. Conglomerates.

The low rounded islands of granite that form a wide fringe along the south shore of the lake, are covered by these blocks of sandstone and limestone, the latter predominating towards the western side of the lake. Many of these blocks contain more than fifty cubic feet, and are apparently almost undisturbed.

Economic Minerals.

Gold. *Gold.*—This metal was not actually observed in any of the rocks along the routes followed; but it may occur in the numerous small quartz-veins that cut the Huronian rocks, carrying iron- and copper-pyrites when close to the eruptive masses penetrating this formation. The shales of the Cambrian formation are also cut by numerous quartz-veins, often highly charged with pyrites; and these may contain gold, although careful examination of a number of them failed to show traces of free gold. It is to be regretted that circumstances prevented the search from being carried on by panning the gravels of these areas. The most promising localities for future investigation are along the Koksoak River, especially in the vicinity of the Manitou Gorge, a few miles above the mouth of the Stillwater River, where the quartz-veins carry abundance of pyrites, and some of them small quantities of galena.

Silver. *Silver.*—This metal has only been found associated with lead in the limestones of the Cambrian area of the east coast of Hudson Bay, where, according to Dr. Bell,* it occurs in bunches of galena in a band of magnesian limestone twenty-five feet thick, in quantities sufficient to be of economic value. This band was traced from Little Whale River to Richmond Gulf, a distance of about twelve miles. Assays by Dr. Harrington give 5·104 to 12·03 ounces of silver per ton. An opening was made by the Hudson's Bay Company at Little Whale River several years ago, but the working proved unprofitable and was soon abandoned. This galena-bearing band of limestone was not observed in the Cambrian areas of the interior, and that ore was only found in small quantities in a few little quartz-veins along with pyrites.

Copper. *Copper.*—Copper-pyrites is sparingly met with in the Huronian, but not in the Laurentian or Cambrian rocks along the routes traversed. In the neighbourhood of Paint Mountain, on Lake Chibougamoo, the chloritic schists are charged with a small percentage of copper-pyrites associated with iron-pyrites; but where seen the ore was too sparsely disseminated to be of economic value, and the indications of copper

* Report of Progress, Geol. Surv. Can., 1877-78, p. 20 c.

here are only valuable as pointing to the possible occurrence of more concentrated bodies of ore in the neighbourhood. On the East Main River, a few miles above the mouth of the Broken-paddle River, copper-pyrites was met with in small quartz-veins, cutting the chloritic schists of Huronian age.

Iron.—The immense deposits of magnetite, hæmatite and siderite in the Cambrian formation, and their wide-spread distribution, may at some future date be of economic importance, especially those containing a large percentage of manganese which fits them for use in the manufacture of steel by the Bessemer process. The mode of occurrence of these ores appears to be closely analogous to that of the iron ores of Michigan and Wisconsin.* Iron.

The ores are always associated with a cherty limestone, and this cherty carbonate of lime is very wide-spread, being met with on the east coast of Hudson Bay, at Lake Mistassini, and along the Koksoak and Hamilton rivers. The associated iron carbonates are more limited in their distribution, being confined to portions of the country adjacent to Koksoak and Hamilton rivers, and to the northern part of the Hudson Bay area. Possible mode of formation of the ores.

C. R. Van Hise, holds that the similar ores of Michigan and Wisconsin were originally deposited as carbonates along with lime and silica, and that the richer ores of magnetite and hæmatite are concentrations of the iron so deposited, carried by leaching waters holding silica to the lowest beds, where they were re-deposited in a concentrated form, in troughs formed by the tilted lower fragmental beds of the series on the one side, and trap dykes on the other.

From the limited study of the Labrador areas, it is impossible to say whether this is the general case there, but on the Hamilton River, several of the large deposits of magnetite were close to, and apparently influenced by large dykes of diabase. Only in one place were the richer ores found undisturbed, at the entrance of Menihek Lake, and here they rested upon a flat-bedded impervious trap-rock. Along the Koksoak River, large dykes are not seen, and the rich ores are found always beneath and associated with the cherty carbonate ores, but in some places they did not appear to lie beneath these, but were rather interbedded with them.

The bedded iron ores are first met with in descending the Koksoak River, on the south bank, just below the Shale Chute, or a few miles below Cambrian Lake, where a thin section of jaspery magnetite is overlain by twenty feet of cherty limestone containing large blotches Ores of Koksoak River.

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* U. S. Geological Survey, Monograph XIX. Penokee Iron-bearing Series of Michigan and Wisconsin.

Shale Chute.

of carbonate of iron. The following analyses of the ores were made in the laboratory of the survey by Mr. F. G. Wait :—

The jaspery magnetite ore :—

		Per cent.
(1.)	Metallic iron	31·28
	Insoluble matter	55·71
	Titanic acid	none.

The carbonate ore of the upper beds is described as a mixture of ankerite and magnetite.

		Per cent.
(2.)	Metallic iron	33·62
	Insoluble matter	4·99
	Titanic acid	none.

Exposure of bedded ores. Shale Chute to Swampy-bay River.

For the next ten miles, to the mouth of the Swampy-bay River, exposures of iron-bearing rocks are almost continuous, and the amount of ore in sight must be reckoned by hundreds of millions of tons. The ore is not everywhere high-grade, and probably a large proportion of it would be unprofitable to work, but there is certainly an almost inexhaustible supply of high-grade ore. It may here be mentioned that specimens were not procured from the thickest and richest beds, owing to the impossibility of breaking up the rounded and glaciated surfaces with the small hammers. Two miles below the last-mentioned exposure, the rocks were found to consist of a twenty-five-foot bed of jaspery ore, composed largely of magnetite with a small admixture of hæmatite, underlain by ten feet of siliceous, ferruginous limestone, holding spathic ore in bands and nodular masses up to several hundred pounds in weight. A great part of the magnetite is nearly pure and contains little jasper. The beds are exposed along the right bank of the river for more than a quarter of a mile.

Five miles below Swampy-bay River.

The rocks were again examined three miles and a half farther down-stream, where only the cherty carbonates were found ; but half a mile below, the river passes close to a high hill on the west side, where fifty feet of red garnetiferous, siliceous, ferruginous shale and jasper are overlain by 200 feet of jaspery ore, composed chiefly of magnetite and coloured by an admixture of hæmatite. An analysis of the ore in the garnetiferous rocks gave :—

		Per cent.
(3.)	Metallic iron	19·14
	Insoluble matter	72·86
	Titanic acid	none.

And another analysis of the ore from the beds above gave :—

		Per cent.
(4.)	Metallic iron	48·29
	Insoluble matter	30·62
	Titanic acid	none.

On the same side, half a mile below, the section exposed on the hill-side shows 400 feet of jaspery magnetite and hæmatite, overlain by fifty feet of cherty carbonate ore. A specimen of the jaspery ore containing a large percentage of hæmatite gave :—

		Per cent.
(5.)	Metallic iron	54·35
	Insoluble matter	16·03
	Titanic acid	none.

The bedded iron ores outcrop along the river for about three miles farther down-stream to near the mouth of the Swampy-bay River, and then the main stream turns eastward and passes between banks of shale and siliceous limestone, so that the iron-bearing members are not again seen along its banks.

On the Hamilton River, the cherty carbonate rocks are well developed along the shores and in the hills surrounding the lakes from Birch Lake to the Menihek Lakes on the Ashuanipi Branch. The faulting of the rocks has caused these measures to be repeated in four ridges in a distance of about twenty-five miles across the strike. The most westerly ridge runs along the west side of the Menihek Lakes ; the next is along the east side of Astray Lake ; the third forms the ridge between Dyke and Petitsikapau lakes, and the last forms the watershed between Petitsikapau and the head-waters of the George River. Iron ores of Hamilton River.

The concentrated magnetite and hæmatite ores were first met with at the rapid at the discharge of Dyke Lake, where two beds each about five feet wide were found associated with cherty carbonate and a siliceous trap ash-rock. At the narrows into Lake Petitsikapau, over twenty-five miles beyond along the same ridge, the ores again come out on the shore for 200 feet, with a width of twenty feet. Analysis of the ores from this place gave :— Ore near Lake Petitsikapau.

	Per cent.
Metallic iron	30·43
Insoluble matter	51·22
Titanic acid	none.

At the head of the middle northern bay of Astray Lake, there is a low hill where 150 feet of jaspery magnetite and hæmatite are seen. Some of the ore-beds are two feet thick between the jasper partings. Fifty feet of similar ore are exposed on the shore of the north-east bay, about two miles from its head.

At the outlet of the Menihek Lakes, large blocks of jaspery ore are scattered about, and they appear to rest horizontally on beds of trap. Here the magnetite and jasper are arranged in distinct layers, and the Manganiferous iron ores.

jasper is not broken as in all the other exposures where the rocks have been disturbed. This ore on analysis gives :—

	Per cent.
Metallic iron	40·72
Insoluble matter	29·90
Titanic acid	none.

These were all the outcrops met with on the waters of the Hamilton River, but they are sufficient to show that the deposits are wide-spread and that the ores will be found in practically inexhaustible quantity.

In the Hudson Bay area, the more concentrated ores are not abundant, but there are great thicknesses of the cherty carbonates. Specimens of the ores brought home by Dr. Bell and analysed by Dr. Harrington, gave:—

	Per cent.
Metallic iron	25·44
Carbonate of manganese	24·00

an excellent ore for spiegeleisen, and for conversion with richer ores into Bessemer steel.

The percentage of manganese in the ores from the Koksoak River area is considerably lower than in the Hudson Bay ores, but sufficient is present to give promise of richer deposits. The following analyses of No. 2 and No. 5, show the percentage of manganese in these ores :—

		Per cent.
(No. 2.)	Ferric oxide	23·43
	Ferrous oxide	21·32
	Manganous oxide	1·34
	Insoluble residue	6·72
(No. 5.)	Ferric oxide	80·17
	Ferrous oxide	0·35
	Manganous oxide	3·09
	Insoluble residue	13·78

Mouchelagan River. Great bed of magnetite.

On the portage-route past the upper part of the Mouchalagan River, thick bands of magnetite were met with on Little Matonipi Lake, and on the portage leading northward from the larger lake, the Indians report that there is a hill of similar ore several miles west of the last-mentioned place in the same direction as the strike of the rocks. Large masses of similar ore were also seen on the Mouchalagan River, so that it appears that this deposit may be traced more than forty miles along the strike. The ore is associated with the mica-gneisses and limestones of the supposed bedded series of the Laurentian. In composition it varies from a pure magnetic ore to a ferruginous gneiss. The quantity of ore seen is very great, as the band is more than 100 feet wide.

Titanic Iron Ore.—Throughout the great anorthosite areas of the peninsula, ilmenite or titanic iron ore is always found in more or less abundance, varying from small grains to masses several tons in weight. The banks of the rivers passing through these areas usually have thick beds of black iron-sands scattered at intervals along them, these iron-sands being derived from the disintegration of the anorthosite rocks. Ilmenite.

Pyrites.—This mineral is abundantly found both in the Huronian and Cambrian rocks. In the area of Huronian to the south-west of Lake Mistassini, the chloritic schists, close to the junction of the eruptive masses of basic and acidic rocks, are always highly charged with pyrites. At Paint Mountain, on the south-west shore of Lake Chibougamoo, the schists are very pyritous, and a zone extending twenty feet from the contact with the granite mass holds at least twenty-five per cent of pyrites. Along the narrows leading to the east end of the lake, highly pyritous chloritic schists are met with for upwards of a mile. Pyrites.

On the East Main River, the schists at Conglomerate Gorge, in the vicinity of the large diabase dyke, are highly pyritiferous. Three miles above the gorge there is another large area of schist charged with pyrites.

Half a mile above the mouth of the Wabamisk River, is a large deposit of pure pyrites in a green chloritic schist. Where it is exposed along the river, the deposit is ten feet thick and 100 feet long, being concealed under drift at both ends. Large outcrop of iron pyrites.

In the Cambrian formation, pyrites is found in nearly all the strata, and is always present in the black and green shales. The black shales, when exposed in cliff-faces, always weather brownish-red from the oxidation of the contained pyrites. This mineral is particularly abundant at the Shale Chute, where it is found strung out in lenticular masses between the partings. In many places these masses are so large and close together that, if they were more accessible, they might form a pyrites ore. At the Manitou Gorge, similar masses of pyrites are present in the black shales and also in the quartz-veins cutting them.

Along the Hamilton River, the black shales are usually charged with pyrites, but no locality was seen where the percentage was sufficiently great for profitable working.

Anthraxolite.—A bituminous mineral with the lustre and colour of anthracite, is found in the Cambrian black shales and limestones, where it occurs either as irregular veins or in small irregular globules in veins of quartz and calcite, cutting the limestones. This mineral is widely distributed, being found at Lake Mistassini, at Petitsikapau and Anthraxolite.

Menihek lakes on the Hamilton River, and also on Long Island in Hudson Bay.

At Lake Petitsikapau the largest amount was found in loose blocks scattered about with broken shale, and, from the pieces found, it probably occurs as a vein from six to eight inches wide, with quartz lining the vein. The mineral is arranged in small flattened plates set at right-angles to the walls and these plates inclose little rounded grains of quartz, and are themselves often coated with ferric hydrate. The following is an analysis of a specimen from this locality made by Dr. Hoffmann :—

	Per cent.
Water (at 110°–115° C.)	3·56
Additional loss on ignition in closed vessel	2·48
Fixed carbon	86·83
Ash (light reddish-brown)	7·13
	100·00

"The ash, which consisted for the most part of silica, would appear to be almost solely derived from accidental impurities, a view strengthened by the fact that other fragments of this material—which, although most carefully picked, were not regarded as absolutely above suspicion —left on ignition but 0·31 per cent of ash."

The analysis of a fragment picked up on Long Island, and also examined by Dr. Hoffmann, gave 94·91 per cent of fixed carbon and only 0·25 per cent of ash.

Its character.

From the above analysis and the mode of occurrence of this mineral, it is seen that it is the result of the hardening of probably liquid bitumen, derived from the carbon of the adjoining rocks, and inclosed in quartz or calcite veins, where it has lost much of its volatile matter and has assumed its present form. It is obvious that the occurrence of this mineral affords no indication of the existence of coal, as ordinarily understood, that is in beds of economic value for mining and burning.

Mica.

Mica.—This mineral often occurs in large crystals in the massive pegmatite dykes met with everywhere throughout the Archæan rocks, but in very few places was commercial mica found, owing to the bent and broken nature of the crystals. The best locality noted was on the East Main River, between the Talking and Island falls, where the mica was in large plates of a light greenish coloured muscovite. Near the head of Lake Winokapau, fine crystals were seen in a large dyke of red pegmatite, and other localities might be mentioned which would repay prospecting if they were more accessible.

Ornamental Stones.—The agates found in the melaphyres of the Hudson Bay coast are often large and beautifully coloured and banded, and would polish well. The jasper of the iron-bearing rocks varies in colour from bright vermilion to crimson, and sometimes green. The red varieties are often in large masses, and slabs several square feet in surface and more than six inches thick, are easily obtained in many places. On the Koksoak River there is a thick band of apple-green jasper, brecciated with small angular fragments of the red varieties, which might be used for pannels and other decorative purposes. On the Hamilton River, near the outlet of Dyke Lake, the jasper conglomerate is in places formed of small pebbles cemented with white quartz and it can take a high even polish. Ornamental stones. Jasper.

Labradorite of the precious variety occurs in great abundance on the north-east side of Lake Michikamau, where large and beautiful crystals of this mineral are seen continuously along the shore for more than ten miles. The play of colour in these large crystalline masses when placed below the surface of the water is particularly splendid, the opalescent hues varying from deep cobalt-blue to green and bronze yellow. On some of the faces the lines of growth of the crystal are distinctly marked by the different colours arranged in concentric bands. Among other localities where the precious labradorite is found, may be mentioned the islands in Lake Ossokmanuan, and the shores of the Romaine River above the burnt lakes. Labradorite.

Building Stones.—Many of the limestones of the Cambrian areas would answer admirably for building purposes, as would also the hornblende-granites, but, as the rocks are so far away from any point of shipment, they are valueless. Building stones, cement rock, etc.

Cement Rock.—The rusty-weathering bands of magnesian limestone might very probably yield a hydraulic cement on burning.

Grindstones.—The hard sand-rock at the base of the Cambrian, would answer for this purpose, while the fine-grained cherty beds in the limestones would make good hone-stones.

Excellent flag-stones could be obtained from the green felsite slates of the Cambrian, and other materials such as brick clays, etc., of economic value, when near settlements, are abundant in the Labrador Peninsula, but are practically valueless owing to the distance from any market.

Glacial Geology.

The observations of striæ and other glacial phenomena taken along the different routes followed during these explorations, in conjunction Extent and movement of the ice.

with similar evidence previously obtained on the rivers flowing westward into Hudson Bay, all show that the Labrador Peninsula, with the exception of a narrow strip of highlands along the North Atlantic Coast, was completely covered with ice during a portion at least of the glacial period. The movement of the ice followed the general slope of the country outward in all directions from a central gathering-ground, or nevé, and the thickness of the ice was such that in its flow it passed over ridges and valleys unchanged, or with only minor deflections.

Either the greatest thickness of ice was to the northward of the southern watershed, or there have been slight changes in the relative levels of the central area since the glacial epoch, as the present watersheds do not altogether correspond to the former central nevé grounds.

Position of central nevé.

The central nevé ground, characterized by but slight traces of glacial motion, is situated about midway between the east and west coasts of the peninsula, and between latitudes 53° and 55°, consequently its southern boundary is from fifty to two hundred miles north of the present southern watershed.

Its characteristics.

The region occupied by this nevé is marked by the presence of partly rounded boulders and angular blocks of rock scattered indiscriminately over hill and hollow. These blocks and boulders, in the great majority of cases, rest upon rocks of the same kind, and have evidently not been transported to any distance from their original positions. They are often of great size, and are heaped together loosely, so that it is a dangerous undertaking to scramble up the steep sides of the hills owing to the liability of displacing them. In many places large blocks are seen perched upon much smaller ones, even on the very summits of the highest rocky hills. Either these conditions of the loose rocks must be due to their having been sub-angular cores in the rotted gneisses and granites, from which the finer material has been carried by water or by slowly-moving ice; or their present position is due to the boulders having been dropped upon one another from the ice-sheet that inclosed them when the ice finally melted away. The former supposition seems the most likely. The loose piles along the sides of the hills may in a great measure be due to the simple falling of the harder cores from higher elevations after the removal of the finer material, and the disappearance of the ice.

Few traces of glaciation in it.

In that part of the nevé ground crossed between Nichicun and Kaniapiskau lakes, the country is very rough and broken into ridges of sharply rounded hills of granite, that rise from 300 to more than 800 feet above the neighbouring lakes. In this area the signs of glaciation on the rock surfaces are very indistinct and no well-marked striæ were found showing the direction in which the ice moved. The outlines of the hills, although rounded, are much sharper and more angular than in the regions where the glaciation is well marked by striæ and where the smaller angular projections have been reduced to a common gentle curve by the grinding power of the ice-transported drift.

The following list of glacial striæ will show the various directions of the ice-movement down the different slopes of the peninsula. General directions of motion of ice.

The watershed south of Lake Mistassini, extends from north-north-east to south-south-west and slopes rapidly towards the north-west, falling from 300 to 500 feet in a few miles, thus forming an escarpment that has been observed to extend from Lake Temiscamie to the north-east of Lake Mistassini, to beyond Lake Obatagoman to the south-west of that lake, or in all more than 200 miles. This escarpment appears to have played an important part in determining the direction of the ice-flow in that region. Watershed south of Lake Mistassini.

On the north side of the escarpment, along the Mistassini lakes and the large lakes to the south-west of them, the general direction of glaciation was toward S. 30° W., or nearly parallel to the trend of the escarpment. Glaciation north of watershed.

On the southern watershed, near its head, and on a considerably higher level, the glaciation was not intense. There was, seemingly, an area where the ice-movement was small, and not to a considerable distance southward are the glacial striæ well-marked, when, as on the different branches of the Chamouchouan River, they show a movement towards the south or generally a few degrees to the east of south. On the Manicuagan River and the surrounding table-land, to the head of the river in Summit Lake, the direction of the ice-movement runs a few degrees west of south. At Summit Lake, on the watershed between the Manicuagan and Koksoak rivers, the striæ are well marked on the top of a hill 565 feet above the lake, thus showing that the thickness of ice here was considerable, and that the centre of movement was situated to the northward of the present watershed. South of watershed.

Northward of Lake Mistassini, two sets of striæ are found, extending to the East Main River and down that stream to within 200 miles of the coast. The older of these sets runs S. 20° W., or nearly parallel to the direction of flow about Mistassini. The newer set extends from the nevé region about Lake Nichicun, where the general direction of the ice-movement is towards S. 40° W. to the vicinity of the portage-route from the Rupert River to the East Main, or about 300 miles Two sets of striæ north of Lake Mistassini.

from the coast. Beyond this, as the coast is approached, the direction of flow gradually tends more and more towards the west, until within the last hundred miles the general course is S. 70° W.

Striæ on various rivers east of Hudson Bay.

When within fifteen miles of the mouth of the river, there is a rapid change in the direction of the striæ, which from here to and about the mouth of the river run about S. 40° W. As stated in a former report,* along the Big River, which flows into the east side of James Bay about 120 miles to the north of the East Main River, the general direction of the striæ for more than 200 miles inland is towards S. 75° W. The direction along the interior route between the Big and Great Whale rivers is S. 60° W., and along the lower course of the last mentioned stream N. 70° W. Farther north, in the area between Clearwater Lake and Richmond Gulf, the glacier moved S. 80° W., or everywhere a few degrees north or south of west into Hudson Bay, at all times following the general slope of the country.

Northward motion of ice.

The first definite striæ showing a northward movement of the ice, were met with at Lake Kaniapiskau, where the striæ run N. 85° E., and after a few miles along the Koksoak River, they bend round to N. 60° E., and then to N. 20° E., which general direction they hold until the Koksoak River passes down off the table-land into a distinct deep valley. In the valley, the direction of the striæ is to a great extent governed by its trend, and runs east or west of north with the valley. Not until the valley widens out and the surrounding country falls away, below the junction of the Stillwater River, do the striæ again have a uniform course of N. 40° E.

On the hills about the Hudson's Bay post, situated some twenty miles above the mouth of the George River, which flows into the south-east corner of Ungava Bay, the glaciation is towards N. 60° E. Near Port Burwell, just inside Cape Chidley, the north-eastern point of Labrador, the lower hills only are glaciated, and the striæ run N. 10° E. On Hamilton Inlet, where the highest hills are rounded and have been apparently well-glaciated to their summits, the direction of the striæ is north-east, or parallel to the general direction of the inlet.

Striæ of Hamilton River valley.

In the valley of the Hamilton River, the conditions are not favourable to the study of the course of glacial movement, owing to the great depth of the valley below the general level of the table-land, as well as to the few exposed rock surfaces. The snow was also deep at the time this valley was examined. Striæ were found on the rocks at the Muskrat Falls, about twenty-five miles above the mouth of the river, where they run directly east. From here no striæ were observed until Lake

*Annual Report, Geol. Surv. Can., vol. III. (N.S.), p. 62 J.

Winokapau was reached, where the southern wall of the valley only is rounded and striated by ice. In the valley the movement was directly east, while on the top of a small peak on the table-land, on the south side of the head of lake, the striæ run N. 80° E. The only other striæ noted in this valley occur about seven miles below the Big Hill Portage, and there the direction is S. 65° E.

On rising with the river to the level of the table-land at the Grand Falls, the whole surface is well-glaciated, and striæ are found on the summits of the higher hills. In the vicinity of the Grand Falls the ice-movement was towards S. 70° E. Following the river upward to Sandgirt Lake, the striæ are found to vary in direction from S. 45° E. to S. 70° E. This variation appears to be due to the occurrence of two distinct sets of striæ, which, however, were never seen crossing each other. Near Grand Falls.

Along the Ashuanipi Branch, as far as Dyke Lake, the direction of flow continues towards S. 45° E. Here an older set of striæ towards N. 60° E. is found, at first imperfectly seen beneath those first noted, but in the course of a few miles becoming much better developed as those of the other set gradually die out. About Lake Petitsikapau, only the N. 60° E. set is found, even on the high hills (420 feet) about the north side of the lake. On a small area between Dyke and Astray lakes, the ice-movement appears to have been somewhat erratic, and sets of striæ having S., S. 50° W. and S. 50° E. directions are found. About Astray Lake and along the river above to the Menihek Lakes, the direction is again constant and towards S. 50° E. Along the Menihek Lake and the river stretch above, to the end of survey on the Ashuanipi Branch, no striæ were noted on the few rock exposures met with. This was due to the broken character of the rock, and does not imply any exemption from ice action. Passing north-eastward from Sandgirt Lake to Lake Michikamau, the direction of the striæ varies from S. 70° E. to E. On Ashuanip Branch. Two sets of striæ.

On the Attikonak Branch of the Hamilton River, above Sandgirt Lake, two sets of striæ are met with, S. 45° E. and S. 75° E. respectively, the last being the older. Along Ossokmanuan Lake the older set dies out, leaving the newer striæ, which at the head of the lake bend more to the southward (S. 5° E. to S. 20° E.) until Attikonak Lake is reached, when the general direction again becomes S. 45° E. This direction is maintained southward along the Romaine River to where the portage-route leaves it for the St. John River. On the area of high anorthosite hills between the rivers, striæ were found only at the first lake of the portage-route, and are there S. 10° E. The absence of striæ in this region is due rather to the rotted state of the rock On Attikonak Branch and southward.

surfaces than to the want of glacial action, as there is distinct evidence in the drift and in the rounded outlines of the hills to show that it was ice-covered.

Along the St. John River the course of the striæ is influenced by the direction of its deep valley, the striæ following in the main the course of the river.

Probable great thickness of ice.

The strong glaciation of the highest hills in the interior, on the edges of the nevé region, the constant directions of the striæ over hill and valley, and the fact that the general slope of the plateau from the interior outwards is very slight and does not exceed two or three feet per mile until within a few miles of the coast, all point to a considerable thickness of ice in the interior such as to cause the strong, radial flow of the ice evidenced by the glaciation of the region.

The following list of striæ, from which the above summary has been compiled, includes all the observations taken during the seasons of 1892, 1893 and 1894.

List of glacial striæ.

List of Glacial Striæ.

Southern Watershed.

Chamouchouan River :—	Direction.
Chaudière Portage	S. 15° E.
2nd Portage Chief River	S.
5th " " "	S. 35° E.
3rd " Sapin Croche River	S.
Lake Bonhomme	S. 12° W.
File-axe Lake	S. 05° E.
20 ft. chute, Shegobiche River	S. 25° E.
Chegobich Mountain	S. 05° E.
Height-of-Land Lake	S.
Romaine River :—	
Mouth of Attikonak Portage Creek	S. 45° E.
At rapid, two miles below	S. 45° E.
Foot of Upper Burnt Lake	S. 45° E.
12 miles below Burnt Lakes	S. 45° E.
At Two Chutes	S. 30° E.
Portage route to St. John River, 1st lake	S. 10° E.
St. John River :—	
1 mile below portage route from Romaine River	S. 30° E.
3 miles " " " " " "	S. 40° E.
3 miles below Upper Forks	S. 05° E.
13 miles below Portage	S. 25° W.
3 miles below Chambers River	S. 05° E.

	Direction.
Manicuagan River :—	
4 miles above the mouth of the river	S. 45° E.
Below the 4th portage	S.
10 miles below the 5th portage	S. 10° E.
10 miles up west shore Mouchalagan Lake	S. 55° E.
Partridge-tail Hill, " "	S. 20° E.
Mouth of Mouchalagan River	S. 20° E.
Entrance to Little Matonipi Lake	S. 10° W.
On summit leading from Matonipi Lake	S. 5° W.
On summit near Kichewapistoakan Lake	S. 5° W.
1st chute south-west branch, Attikopi River	S. 45° E.
3rd chute " " " "	S.
Near entrance to Lake Naokokan	S. 15° W.
On summit of hill, 3rd lake beyond Attikopish Lake	S. 40° E.
On summit of hill, south end Summit Lake	S. 10° W.
On east shore, Summit Lake	S. 10° W.
On hill (565 feet) at north end Summit Lake	S. 5° W.
On east shore Itomamis Lake	S. 8° W.
Western Watershed.	
Lake Chibougamoo :—	
Paint Mountain	S. 30° W.
South-west Point	S. 15° E.(?)
At narrows	S. 33° W.
Lake Wahwanichi	S. 20° W.
Lake Mistassini :—	
Near outlet	S. 23° W.
Islands in centre	S. 23° W.
Rupert River :—	
1st portage	S. 25° W.
3 miles below	S. 30° W.
Pinched-neck Lake	S. 25° W.(?)
" "	S. 18° W.
Portage route between Rupert and East Main rivers :—	
Lake No. 1	S. 53° W.(?)
" " 4	S. 55° W.(?)
" " 7	S. 53° W.(?)
Huronite dyke, Lake No. 7	S. 25° W.
Summit of Hill Portage	S. 18° W.
Lake No. 11	S. 35° W.
" " 13	S. 35° W.
Clearwater Lake	S. 43° W.
Discharge, Clearwater Lake	S. 45° W.
East Main River :—	
On shore of James Bay, 13 miles north of river	S. 38° W.
On shore of James Bay 9 miles north of river	S. 48° W.
" " 4 " "	S. 49° W.
Governor's Island, at mouth of river	S. 45° W.
5 miles above mouth of river	S. 48° W.
12 " " "	S. 40° W.
At head of tide	S. 62° W.
Basil Gorge	S. 62° W.
1 mile below Talking Fall	S. 70° W.

	Direction.
Island Fall	S. 66° W.
Clouston Gorge, at foot	S. 54° W.
" " middle	S. 69° W.
" " head	S. 60° W.
Conglomerate Gorge	S. 71° W.
10 miles below Kausabiskau River	S. 68° W.
8 " " " "	S. 71° W.
4 " " " "	S. 68° W.
2 " " Wabistan River	S. 63° W.
At mouth of " "	S. 65° W.
4 miles below Wabamisk River	S. 65° W.
2 " " " "	S. 58° W.
3 " " Akuatago River	S. 53° W.
At mouth of " "	S. 58° W.
4 miles above " "	S. 65° W.
12 miles above the last	S. 65° W.
2 miles below Great Bend	S. 57° W.
At foot of " "	S. 57° W.
5 miles down " "	S. 55° W.
1 mile below north-west bend	S. 40° W.
½ " " " "	S. 36° W.
1 mile above lake expansion	S. 22° W.
1 " " Sharp Rock Portage	S. 40° W.
At next chute above	S. 38° W.
Mink Portage	S. 40° W. S. 15° W. (old)
Channel Portage	S. 40° W.
4 miles above last	S. 35° W.
Cascade Portage	S. 45° W.
Opemiska Lake at entrance	S. 45° W. S. 25° W.
" " (east end)	S. 40° W.
Rapids between Opemiska and Wakemen Lake	S. 40° W.
Wahemen Lake	S. 38° W.
Big River:—	
2 miles below portage from Crooked Lake	S. 40° W.
Little Back Lake	S. 33° W.
1st portage below Lake Nichicun	N. 80° W. (?)
Square-rock Lake	S. 30° W. S. 40° W.
Eagle Lake	S. 55° W.
Koksoak River:—	
Lake Kaniapiskau	N. 50° E.
3 miles below Lake Kaniapiskau	N. 60° E.
8 " " last	N. 60° E.
23 " " "	N. 55° E.
At head of Great Bend	S. 56° W.
½ mile below last	N. 25° E.
Middle of Big Island	N. 20° E.
Foot of Big Island	N. 25° E.
Foot of 1st gorge	S. 85° E.
8 miles below last	N. 15° E.
3 " "	N. 25° E.
12 " "	N. 20° E.
6 " "	N. 25° E.

	Direction.
15 miles above Sandy River	N. 55° E.
3 " " " "	N. 30° E.
2 " " " "	N. 60° E.
At 2nd gorge	N. 20° E. N. 25° E. N. 60° E.
At chute 1 mile below 2nd gorge	N. 30° E. N. 55° E. N. 70° E.
On portage past Eaton Cañon	N. 5° W.
5 miles below Goodwood River.	N. 25° W. N. 40° E.
6 miles below last.	N. 25° W. N. 35° E.
2 miles above Granite Fall	N. 53° E.
At Granite Fall	N. 30° E. N. 50° E. N. 70° E.
12 miles below Granite Fall	N. 5° W.
4 miles below Broken-paddle River	S. 57° W. S. 14° W. (old)
2 " above " " "	S. 58° W.
5 " " " " "	S. 54° W.
3 " " the last	S. 54° W.
7 " " " "	S. 49° W
4 " " " "	S. 53° W.
9 " " " "	S. 51° W.
11 " below Prosper Gorge	S. 50° W.
Foot of " "	S. 51° W.
At chute " "	S. 53° W.
3 miles above " "	S. 51° W.
Foot of Ross Gorge	S. 47° W.
Outlet of Nesaskuaso	S. 43° W.
1 mile below foot of Grand Island	S. 43° W.
3 miles above " " "	S. 43° W.
Head of " "	S. 18° W.
Two miles above " "	S. 47° W. S. 18° W. (old)
Tide Lake	S. 43° W.
Mouth of Tichagami River	S. 47° W.
End of Survey, 1892	S. 43° W.
3 miles above last	S. 40° W.
Mouth of Kawatstakau River	S. 42° W.
2 miles below Sunday Portage	S. 38° W.
1 mile below Pond Portage	S. 40° W.
10 miles below Death River	N. 51° W.
Bend of Cambrian Lake	N. 25° E.
On peninsula 3 miles below last	N. 25° W. N. 10° W. N. 50° E. N. 30° E.
At Shale Chute	N. 20° W.
2 miles above Swampy-bay River	N. 35° E.
3 miles below Stillwater River	N. 35° E.
8 miles " " "	N. 40° E.
17 miles " " "	N. 40° E.
Head of Tide.	N. 40° E.
Fort Chimo	N. 40° E.

	Direction.
George River :—	
On island opposite H. B. Post	N. 60° E.
On hills in rear " "	N. 60° E.
Port Burwell	N. 10° E.
Eastern Watershed.	
Lower Hamilton River :—	
At Muskrat Falls	E.
5 miles above Muskrat Falls	N. 85° E.
Lake Winokapau	E.
On Summit at head of Lake Winokapau	N. 80° E.
4 miles below Portage River	S. 65° E.
Upper Hamilton River :—	
Grand Falls	S. 70° E. S. 50° E.
1 mile above Grand Falls	S. 70° E.
On hill east of Jacopie Lake	S. 70° E.
On west side Lookout Mountain	S. 50° E.
On summit	S. 65° E.
Jacopie Lake, at end of portage	S. 60° E.
" " on island	S. 64° E.
" " "	S. 48° E.
" " east channel	S. 44° E.
Head of Flour Lake	S. 72° E.
Outlet of Sandgirt Lake	S. 60° E.
Ashuanipi Branch :—	
On hill 4 miles above Sandgirt Lake	S. 65° E.
At foot of hill	S. 60° E.
3 miles below Birch Lake	S. 67° E.
Top of Hill, east of Birch Lake	S. 50° E.
Outlet of Dyke Lake	S. 45° E.
Dyke Lake, 8 miles north of Fault Hill	N. 60° E. S. 45° E.
2 miles north of last	N. 65° E. S. 45° E.
4 miles north of last	N. 40° E. S. 50° E.
At Petitsikapau Narrows	N. 60° E. S. 50° E.
North end Petitsikapau Lake	N. 60° E.
Hill on north side Petitsikapau Lake	N. 60° E.
On island, east side " "	N. 50° E.
Hill on north-east side " "	N. 58° E.
Rapids at head of Dyke Lake	S. N. 50° E. S. 50° E.
North end of lake above Dyke Lake	S.
At inlet " " "	S. 50° E.
Quartz Hill, Astray Lake	S. 50° E.
South end " "	S. 45° E.
Rapids between Marble and Menihek lakes	S. 50° E.
Attikonak Branch :—	
Mouth of river, Sandgirt Lake	S. 65° E.
2nd rapid above " "	S. 45° E.
Outlet Gabbro Lake	S. 75° E.

	Direction.
Gabbro Lake	S. 45° E.
" "	S. 80° E.
" "	S. 45° E. / S. 80° E.
Entrance to Ossokmanuan Lake	S. 45° E.
Big Island, " "	S. 55° E.
At inlet " "	S. 55° E.
" " " "	S. 45° E.
" " " "	S. 38° E.
At inlet Panchiamichats Lake	S. 20° E.
1 mile above " "	S. 20° E.
9 miles above " "	S. 5° E.
At outlet Attikonak Lake	S. 15° W.
Attikonak Lake, 4 miles above last	S. 5° E.
" " 3 miles south of narrows	S. 45° E.
" " south-east bay 5 miles to end	S. 40° E.
" " ½ mile beyond last	S. 40° E.
Route to Lake Michikamau:—	
Entrance to Lob-stick Lake	S. 50° E.
" " " (below rapid)	S. 70° E.
Islands in " "	S. 70° E.
" " "	S. 80° E.
East end " "	S. 85° E.
East inlet " "	E.
Outlet Overflow Lake	S. 80° E.
West end " "	E.
Lake Michikamau, west bay	S. 75° E.
" " west side	S. 60°-75° E.
" " east side	S. 78°-85° E.
" " south side	S. 72°-80° E.

Till.

In the southern half of the Labrador Peninsula, a detailed study of the boulder-clay or till is almost impossible, owing to the dense forest growth which covers the greater part of the area. It is only where extensive fires have denuded the surface of its trees, and much of the thick coating of moss and vegetable matter, that some investigation becomes practicable. Such being the case, only general facts relating to the drift deposits of the interior plateau are given here. Till or boulder-clay.

Unstratified drift is found throughout the whole interior, in varying thicknesses. To a great extent it appears to have been formed from the disintegration due to atmospheric decay of the upper portions of the surrounding rock-masses. Everywhere more than seventy-five per cent of the included boulders are from the immediate neighbourhood.

The amount of erosion and the change wrought upon the general surface by glacial action have not been as great as is often supposed. The ice certainly removed a considerable quantity of disintegrated material, with included cores, from the various hills, and deposited it, for the most part, in the adjoining valleys, working with a kind of "cut and fill" action, to reduce the surface to a general uniform level. There is no evidence to show that the glacier ever hollowed or scooped out deep depressions as has been often stated to have occurred elsewhere.

Amount of rock-erosion by ice.

The amount of rotten débris removed from the hills and perhaps also displaced in the valleys, although great, does not represent an extraordinary depth of decayed rock overlying the harder unaltered portion; and the amount of drift now seen throughout the region would not, if evenly distributed over the whole area, afford a thickness greater than 200 feet of loose material.

Resistance of Archæan rocks to waste.

The Archæan rocks that underlie more than three-quarters of the total area of the peninsula, are for the most part not easily disintegrated by the atmosphere, and in many places the striæ present on their surfaces, are as fresh as if made yesterday. This is especially the case when the rock has been protected by even only a very thin coating of drift. From this it may be seen that general erosion is very slow, and that after a certain depth was reached it would practically stop, so that, although an enormous length of time is supposed to have elapsed between the previous submergence of the peninsula in Palæozoic and the beginning of the glacial period, the amount and depth of surface decay was probably much less than might have been anticipated. A further proof of the slow decay of this Archæan mass, is deduced from the deep and ancient river-valleys that extend far inland from the coast on all sides, and of which the Saguenay, Hamilton, Koksoak and Great Whale rivers may be cited as examples. These valleys are the main arteries of drainage of the high interior table-land, and, along with the valleys of their principal tributaries, have been eroded by the water to depths varying from 200 to 1500 feet below the general level, without any corresponding general reduction of the surrounding country to a base-level of erosion, as might have occurred, had the underlying rocks been composed of the softer sedimentary deposits usually holding carbonate of lime.

Great age of amin drainage valleys.

These valleys are of great age, that of the Saguenay having been at least partly formed before the Cambro-Silurian period, while the Hamilton Valley antedated the deposition of rocks of Lower Cambrian age.*

* If the deductions from the evidence above be correct, it follows that the theories advanced by several writers to the effect that the gorge of the Saguenay and other similar valleys in this part of the continent were eroded mainly during the Pliocene uplift immediately preceding the glacial period are incorrect.

The process of formation of these valleys has continued slowly to the present day, by the agency of falling water and of frost. At their heads the valleys can be seen cutting farther and deeper into the central area, as at the Bodwoin Cañon below the Grand Falls on the Hamilton River. These deep-cut valleys, not having yet become complete, the drainage of the central area is by streams flowing in shallow channels, and following the light general slope of the country. In this central region, the former drainage system appears to have been considerably modified by the movement and deposition of glacial drift, which forms low ridges traversing the country, damming back the rivers to form lakes, with rapid stretches between, where the streams either flow over low rocky ledges, or down rapids full of boulders.

Till usually in ridges.

The greatest mass of the till is arranged in long ridges, roughly parallel to the direction of the glacial striæ, and these are often separated by almost driftless tracts, which are rarely seen along the principal water-courses, but are met with when the routes leave the streams and pass through the small chains of lakes, as between the Hamilton River and Lake Michikamau, and at the head of Lake Attikonak. These driftless tracts are, however, small and narrow in comparison with the drift-covered areas. The drift ridges found throughout the country are readily divisible into two distinct varieties. The most abundant vary from moderately sharp to wide flat-topped ridges made up of ordinary till and boulders. Where cut by streams they show a section of till with boulders scattered indiscriminately through the mass. They are probably of the nature of drumlins, and may have been formed under the glacier without the agency of water.

These of two kinds.

Esker ridges.

Eskers or ridges of the other variety are generally very sharp and narrow on top, and their outlines and the minor ridges about them are less regular than those of the drumlins. In section they are always seen to be formed of fine, well-rounded drift, and almost always show signs of stratification. The bedding is generally at low angles, and almost constantly dips in the direction of the ice-flow. Boulders are rarely found in the mass, and when they occur are small and well rounded. These ridges are commonly found along the present courses of the larger streams, and appear, in a manner, to determine their direction. It is supposed that they were formed in the beds of streams flowing on or below the ice, near the close of the period of glaciation, when the movement of the ice had become very slow or had ceased on the almost level plateau, the irregularities in their shape and outline being possibly due to variations in their ice-walled channels.

In many places the surfaces of these ridges are exceedingly irregular in outline and are strewn with boulders. The main ridges are traversed by many minor ones, with "pot-holes" between them. The sides of these minor ridges are exceedingly steep, the slopes being higher than the angle of repose of water-laid deposits. The summits of the ridges are usually very narrow and sharp.

Mode of formation.

In their irregular configuration, with numerous "pot-holes" and boulder-strewn surfaces, these ridges resemble terminal moraines in a striking manner, but their general directions are parallel with instead of transverse to the direction of the ice-movement. The conclusion arrived at in regard to their formation and minor outlines, is that the streams which deposited their finer material, must have flowed over ice and were in turn sometimes covered by ice transporting boulders. At the close of the glacial period, when the glacier was finally receding, this superjacent ice, wherever present, when melting dropped the boulders upon the surface, and then the ice below melted, forming in places the sharp irregular ridges and "pot holes," and causing all the irregularities of surface.

Notably long eskers.

These esker ridges can often be traced for long distances. The longest noted, extends from near Summit Lake, in a direction a few degrees west of south, for nearly one hundred miles, to within a short distance of Lake Pletipi, on the upper waters of the Outardes River. Along the Hamilton River, another, beginning at a jumble of broken rock of morainic character at Flour Lake, follows the present course of the river upwards to Dyke Lake. Still another follows the east shore of the Menihek lakes of the Ashuanipi Branch. And others from ten to twenty-five miles long were noted along the East Main, Koksoak, Romaine and Manicuagan rivers.

Moraines.

In many places, boulders heaped up in ridges that appear to run transversely to the direction of the glaciation were seen, being apparently moraines, marking halts in the retrocession of the glacier; but as it was found impossible to trace out these boulder-ridges, nothing definite can be said about them, beyond the fact that they occur and are sometimes found at the lower ends of the esker ridges.

Local boulders.

Boulders are scattered everywhere over the country, and most of them can be traced to the rocks in the immediate neighbourhood; often they are hardly moved, and have simply been broken by frost from the underlying ledges, the angles of the upper blocks being partly rounded. Heaps of this nature are exceedingly common along the portage-route between the Rupert and East Main rivers, and also on the several portage-routes between the head-waters of the larger streams.

Erratics.

Although by far the greater number of the boulders in the drift belong to the immediate neighbourhood, a considerable percentage

Photo. by A. P. Low, 1894.

ESKER RIDGE, ALONG ASHUANIPI BRANCH, HAMILTON RIVER.

of them is far-travelled. The presence of these "erratics" in the drift, proved to be of practical benefit when ascending the different rivers, as they indicate the character of the rocks which occur farther back along the course of the glaciation. Rounded boulders of the Cambrian rocks of the Upper Hamilton River, were thus met with in the river-valley, a short distance above Lake Winokapau, 150 miles from the nearest outcrop, giving the first intimation that an area of these rocks would be found in that part of the interior. These boulders became more numerous as the river was ascended, and were found on the top of Lookout Mountain (500 feet) near the Grand Falls. Above Sandgirt Lake they form over twenty-five per cent of the drift, and on a nearer approach to the Cambrian area constitute over ninety per cent. of its coarse material. From the presence of large numbers of boulders of hornblende-granite in the drift about the Menihek Lake, it is believed that the Cambrian area does not extend far beyond that neighbourhood. In a similar manner, the occurrence of an abundance of Huronian boulders about the Mistassini Lakes, points to the presence of an area of these rocks in the region immediately to the north-east.

Lake Terraces.

On the table-land of Labrador, terraces are met with in many places, both in the river-valleys and along the sides of the lakes. These terraces have been formed at the former margins of the waters in post-glacial or glacial times, when the level was maintained, either by dams of drift since cut down, or by probable local dams of ice, during the last stages of the glacier. Dams of drift will account for perhaps the majority of these terraces, but others remain which cannot have been formed in that manner, and there is no other evidence to show that the post-glacial marine subsidence in Labrador was sufficiently great to form such terraces at elevations varying from 1500 feet to 2000 feet above the sea-level.

Terraces possibly due to drift damming.

Among cases of the first-mentioned kind, may be mentioned Chegobich Lake, at the head of a small branch of the Chamouchouan River, which flows into Lake St. John. This lake, except to the north-west, is surrounded by rocky hills, and has a narrow outlet to the south-east between similar hills, where a dam of drift sufficient to raise its water twenty feet might have occurred and have enabled it to form the terraces found along its shores up to that level.

Lake Wahwanichi, the large lake that empties into the south-west bay of Mistassini Lake, is surrounded by low terraces up to fifteen feet above its present level, which might easily be accounted for by a slight block along its narrow discharge channel.

No signs of terraces are found about Lake Mistassini, and they would be impossible there without an ice dam, as the land to the north and north-west of the lake is low, and slopes rapidly.

Low local terraces were noted on the shores of a number of the smaller lakes on the various portage-routes, but their importance is not sufficient to require a detailed description.

Others not thus explicable. Michikamau Lake.

The terraces about Michikamau Lake may be taken as an example of those formed along a large body of water, where no local dam of drift would prove sufficient to retain the water at a level requisite for their formation. The highest terraces seen about the lake are thirty-five feet above its present level. These are best seen on the islands of drift that fringe the shores, especially off the entrance to the Northwest River. The islands, when lower than thirty-five feet, are flat-topped and have been evidently levelled by water; when higher, their sides are terraced at that elevation, and above it the surfaces are rolling. In small coves along the rocky shores of the lake, distinct beaches of water-worn pebbles are found at two levels, the highest corresponding to the thirty-five-foot terrace, and the lower being about twenty feet above the present lake. This great lake is surrounded by low, broken ridges, separated by wide, flat valleys, only slightly elevated above the present level of the lake, and to the northward another large body of water is separated from the main lake by a low ridge of drift only. Beyond, wide valleys extend to the head-waters of the George River, without any practical change in the general level. At high stages of water the lake at present discharges into the Hamilton River, through one of the numerous low gaps in that direction. To the southward, similar conditions are said to prevail. To the eastward, with such surroundings, a rise of thirty-five feet in the level of the lake would increase its area enormously; this is practically impossible without some barrier such as does not at present exist, for, owing to the minute differences of level in the surrounding water-surfaces, the lake in such a case would simply pour out in all directions, and might empty by either the Northwest, Hamilton or George rivers. A barrier of ice seems to be the most probable explanation of the manner in which the lake attained its former level, and its extent would then be determined only by the position of the barrier. The present level of the lake is practically that of the highest interior plateau, and with so slight an increase even as thirty-five feet, under present conditions, its water would overflow on all sides, nothing intervening between the lake and the coasts.

At Birch Lake, on the Ashuanipi Branch of the Hamilton River, there is a long esker ridge on the south side of the outlet, dividing it from a deep bay on the same side. The ridge is terraced on both sides into eight low steps. The lowest of these is twenty feet and the highest sixty feet above the present water-level. The terraces are floored with small water-worn gravel. Conditions similar to those about Lake Michikamau exist in this neighbourhood, and an ice-dam only would permit of an elevation of the lake sufficient to form such terraces. Birch Lake

Farther up this branch, towards the head of the Menihek Lakes, there is a persistent terrace ten feet above the present level and another at thirty feet, with others less continuous, one at fifty feet and a couple of intermediate ones. At the upper narrows of the lake, there are three well-marked terraces at thirty, forty and sixty-five feet above the present level, with beaches of gravel on them. These terraces are on drift ridges, with a wide area of country to the south-south-west and west that is considerably lower than the height of the lowest terraces, and the lake, at a level to correspond with the upper terraces, would cover the whole country (with the exception of a few ridges) to, and perhaps beyond, the southern watershed. It must, consequently, have been at least partly enclosed by an ice barrier. Menihek Lakes.

Similar terraces are seen along the lake-expansions of the Koksoak River about twenty miles below Lake Kaniapiskau, where the highest are about fifty feet above the present level of the river and considerably above that of much of the surrounding country. Similar terraces elsewhere.

As has been previously reported,* similar terraces were found on the western watershed along the north side of the Big River, over 200 miles inland from Hudson Bay. The river flows along the southern base of a high plateau, at the foot of which terraces twenty, thirty and fifty feet above the present level of the river and 1500 feet above sea-level are cut into esker ridges. To the south and south-west, the country is low and almost flat, and would have been flooded while the water was at its higher level, forming a lake, which without an ice or other barrier, from what is known of the intermediate country, would have extended to the coast.

River Terraces.

Wherever the rivers approach sufficiently near the coast to pass from their shallow, irregular, post-glacial courses between the ridges of drift, and to enter their ancient distinct valleys cut down below the Relation of river to marine terraces.

* Annual Report, Geol. Surv. Can., vol. III. (N.S.) p. 47 J.

general surrounding rock-surface, their valleys are found to have been wholly or, more often, partly filled with glacial drift. The rivers in these valleys have cut later channels in this drift, leaving it with terraced faces that mark the former levels of the streams. These terraces follow the valleys downward and merge into the marine terraces, formed during the period of subsidence, and it is often very difficult to reach a conclusion as to where the change from one kind of terrace to the other takes place.

Terraces of Koksoak.

Along the Koksoak River, terraces begin to appear immediately below the first gorge, or fifty-five miles below Lake Kaniapiskau. These terraces are at first about fifty feet high, but increase in height as the stream descends in the deep rocky valley, and there rise in places more than a hundred feet above the present river-level. Below the first gorge, for ten miles, the valley is narrow and the current very strong. Along this portion, the terraces are flanked by almost perpendicular walls of tightly packed boulders, to a height from thirty to sixty feet above the ordinary summer level. These boulder-walls are apparently caused by river-ice, which no doubt jams and piles up in the rapids to a great height, and which when the jam breaks moves along with great force at the front of the pent up water behind. A fine example of the size and influence of such a jam was found here on August 16th. Masses of ice more than ten feet thick were still piled along the west bank for a quarter of a mile and from twenty to thirty feet above the water level. These had for nearly three months been exposed to the action of the sun's rays, and were but small remnants of an immense mass of ice which had been pushed far up the banks, scooping out the fine material and boulders and piling them up in ridges several feet high.

Boulder walls.

Heights noted along the Koksoak.

Terraces continue to the junction of the Sandy River, where the river-channel is nearly level with the surrounding country. They are again seen immediately below Eaton Cañon, and the narrow valley to the north of the Goodwood River appears to have been completely choked with drift, the banks being terraced to their summits, 200 feet above the water. From the mouth of the Goodwood to Granite Fall, the terraces are nearly continuous, the best marked being at 60 and 100 feet above the present water-level. Between Granite Fall and the head of Cambrian Lake, the ancient valley is very deep, with rocky walls that rise more than 800 feet above the stream. This valley was filled with unstratified drift, in which the later channel is cut to depths ranging from 200 to 300 feet, with well-marked terraces at and below the 150-foot level. Along the upper part of Cambrian Lake, the till banks are terraced up to 200 feet, with very distinct terraces at 50 and 100 feet, and lower down with a broad one at 20 feet.

Along the flanks of the high hills, about the lower part of the lake, terraced banks are seen at 300, 175, 150, 100, 80, 60, 50 and 20 feet above the level of the lake. Along the river, below the lake, for more than twenty miles, terraces up to 250 feet are freqently seen. After that the valley widens and the hills become lower with long sloping sides, where the terraces are not so well marked. At the foot of the Manitou Gorge, a few miles above the mouth of the Stillwater River, the river has cut its channel out of about forty feet of stiff blue clay, well stratified horizontally, and darkened with an admixture of fine particles of the black shale of which the hills in the immediate neighbourhood consist. This occurrence of stratified clay is believed to be an indication that the sea extended up the river-valley at least as far as this point, and probably beyond, and that the terraces along the wide valley below are of marine rather than fluviatile origin. These will be noticed further on.

Probable marine limit.

The deep valley of the Hamilton River, from the Grand Falls to its mouth, has everywhere been in part filled with drift, which has subsequently to a great measure been removed by the river, and much of it deposited in the upper part of Hamilton Inlet, shoaling its waters for over twenty miles below the mouth of the river. The flanks of the rocky hills that form the walls of the main valley, are covered with drift, cut into terraces which often rise 250 feet above the present level of the stream. These terraces are best seen about the mouths of the small tributaries, where the drift is generally more abundant and the terraces better marked than along other parts of the valley, where the drift is at times very scanty.

Terraces of Hamilton River.

At the time the river was ascended, the banks of the stream in most places were thickly covered with snow, and in consequence less is known about their composition than might have been under more favourable conditions. The junction between the marine and river terraces was not actually determined, but the former probably extend inland about seventy miles, to the foot of the gorge of Gull Rapid.

On the Romaine River, distinct river-terraces are found along the sides of the valley from the Burnt Lakes to where the portage-route leaves it below. The highest of these terraces do not greatly exceed 100 feet above the river-level. Where the portage-route reaches the St. John River, the river-channel is cut out of stratified sands underlain by clay, which can be traced down stream to the mouth of the river and are undoubtedly of marine origin.

Of Romaine and St. John rivers.

River-terraces are found along the shores of the Chamouchouan River, above the Chaudière Falls, where the stream rises above the level of the marine deposits of the Lake St. John basin.

Of Manicuagan River.

Along the whole course of the Manicuagan River, from its mouth to Summit Lake on the watershed, terraces are seen almost continuously. Between Summit Lake and Natokapau, the terraces rise rarely more than 30 feet above the present river-bed. Below the last mentioned place, there is very little drift in the river-valley until the long gorge is passed, when terraces become well-marked on both banks to more than 100 feet above the water. At Lake Mouchalagan, the highest terrace is 150 feet above the lake, with several at intermediate altitudes. Terraces up to 150 feet are common along the steep walls of the river-valley below the large lakes, and, below the first portage above the Toolmistook River, are cut out of marine clays overlain by stratified sands.

Conditions along valleys of East Main and Rupert rivers.

The country of the western slope of Labrador falls gently from the interior towards James Bay, and is not broken by persistent, deep and narrow river-valleys as in the case of the other slopes. The valleys, where they are inclosed between low hills on either side, have at times low terraced banks up to fifty feet above the streams, but as a rule they are much less. On the East Main River, from the neighbourhood of Conglomerate Gorge, eighty miles above the river's mouth, the valley is cut out of sandy marine drift, underlain by clay lower down-stream. As previously described, the river descends in a number of steps, where it rushes down narrow rocky gorges, so that at the foot of each gorge, where it issues into a deep valley in the drift, its banks are high and steep, affording good sections of the marine sands and clays. As the country slopes gradually, at the head of each step the river-valley is but little below the general surface.

The conditions of the valley of the Rupert River are similar to those of the East Main, the marine deposits extending inland along its course for about one hundred miles. To the northward the country rises more rapidly. The Big River has moderately high banks of marine drift for forty miles, and then enters a deep valley between high rocky hills. This part of the river, where it rises to the level of the interior plateau, is unnavigable with canoes for about one hundred miles. The Great Whale River has a deep, distinct rocky valley to within a few miles of the coast, and the sides of the valley are terraced to a level above one hundred feet in many places.

Marine Deposits.

Extent of marine deposits along East coast, Hudson Bay.

Wherever observations have been made on the coasts of the Labrador Peninsula, deposits of marine sands and clays have been found. The breadth of this margin of marine deposits depends upon the height of the country and the amount of subsidence during the period of their deposition. Along the east side of James Bay, the slight elevation of the land along the coast and the gradual rise inland were favourable to the formation of a wide area of marine deposits. As previously stated, continuous beds of clay, overlain by stratified sands, can be traced inland on the Rupert River for more than 100 miles from its mouth. On the East Main River similar deposits extend for eighty miles, and on the Big River more than forty miles, to where the line of exploration left the stream. On the Great Whale River and to the northward, owing to the abrupt ascent to the table-land, these deposits are found only along the coast and a few miles up the larger river-valleys. In Richmond Gulf,* where the land rises abruptly almost 1000 feet above the sea level, ancient sea-beaches are seen up to a height of 440 feet above the present level of the sea. Marine terraces at the mouth of the Clearwater River also rise to an elevation of 350 feet, and in both cases the heights of the beaches and terraces were limited by that of the land where they were found. A short distance inland, terraces of stratified sands, most probably of marine origin, are found 675 feet above sea-level. These probably represent the maximum of subsidence along this portion of the coast. The greatest elevations at which marine deposits are found along the Rupert and East Main rivers, have been only approximately determined by aneroid measurements and by computations of the fall of the rivers, but they may be taken to slightly exceed 500 feet above the present level of Hudson Bay. About Ungava Bay, the elevation, as marked by raised beaches, terraces, and marine deposits, does not appear to have been nearly as great as on the west side of the peninsula, not exceeding 300 feet. The lower portion of the valley of the Koksoak River appears to have formed a long estuary, in which marine clays were laid down to above the forks of the Stillwater River. The highest terraces seen along the flanks of the hills, from Stillwater to the mouth of the river, are about 250 feet above sea-level. Along the George River, from its mouth to the Hudson's Bay post, terraces, up to an altitude of 200 feet, flank the hillsides in protected bays, and probably mark the maximum amount of elevation along this part of the coast.

Height of deposits.

Deposits about Ungava Bay.

Nachvak Bay.

Nachvak Bay, on the Atlantic coast, about one hundred miles south of Cape Chidley, is situated in the midst of the high unglaciated range of that coast. As already noted by Dr. R. Bell,† the mountains about here rise directly from the sea to heights varying from 1500 feet to 3400 feet. These mountains are sharp in outline and their sides are covered with angular fragments of the rocks beneath, in a

* Annual Report, Geol. Surv. Can., vol. III. (N. S.), p. 58 J.
† Report of Progress, Geol. Surv. Can., 1882-84, p. 14 DD.

more or less decayed condition, and without any sign of glaciation except along their lower margins. Behind the Hudson's Bay post, situated some twenty miles from the sea, signs of glaciation were noted by myself up to a height of 340 feet. Along the lower part the rocks are glaciated, the striæ showing that the ice moved outwards from the head of the bay. The upper level is marked by a broken line of erratics deposited along the edge of the upper margin of the ice. The highest sea-beach here is only 180 feet above the present tide-level, which shows that the post-glacial rise has been very slight in this part of the peninsula.

Nain.

Dr. Bell mentions that the hills behind Nain, about 160 miles south of Nachvak, are glaciated to their summits, over 1000 feet above the sea. From here southward, judging from the rounded outline of the hills, it would appear that the whole country has been over-ridden by ice pushing out to the coast. Dr. A. S. Packard* mentions the occurrence of raised beaches along the coast, from the Strait of Belle Isle northward 250 miles to the vicinity of Hopedale. None of the beaches observed by him were more than 200 feet above the present sea-level.

Hamilton Inlet.

Along the high shores of Hamilton Inlet, and more especially along Backway, terraces are well-marked up to a height of about 200 feet. Similar terraces are cut into the drift along the wide margin of low country extending southward from Hamilton Inlet to Sandwich Bay.

At the mouth of the Northwest River, near the head of the inlet, a wide deposit of sand separates the inlet from Grand Lake, a former north-west extension of the inlet. On the sides of the sandy deposit facing the open water of the inlet, there are fourteen distinct terraces, at different heights ranging from eighteen inches to ten feet. The summit of the sandy ridge is 110 feet above the present tide-level, and it is flat on top, with evidence of water-levelling. These numerous small terraces show that the elevation of the land about the head of Hamilton Inlet was very gradual and regular. As has already been stated, marine terraces along the valley of the Hamilton River probably extend about seventy miles above its mouth, to the Gull Rapid Gorge.

Marine deposits along Gulf shore.

The elevation along the Gulf shore of Labrador appears to have increased to the westward. At the Strait of Belle Isle, the highest marine beaches and terraces have an elevation of about 200 feet, while at the mouth of the Saguenay River the highest terraces are more than 600 feet above the level of the river, and in the vicinity of Quebec marine shells have been found 515 feet above the sea,† while

* The Labrador Coast, p. 310.
† Annual Report, Geol. Surv. Can., vol. V. (N.S.), p. 55L.

in the valley of the Chaudière River south of Quebec, Mr. R. Chalmers has traced marine terraces to a height of 895 feet above sea-level. In the valley of the St. John River, deposits of marine clays, overlain by sand, are found continuously for over forty miles inland and to a height of 380 feet above its mouth. Along the Manicuagan River, marine clays can be continuously traced inland for upwards of fifty miles, where they are elevated over 400 feet above the present sea-level. The Betsiamites River, which flows into the Gulf of St. Lawrence about half-way between the Saguenay and St. John rivers, also has terraced banks cut out of marine clays and sands beyond its lowest fall, or more than fifty feet from its mouth and about 400 feet above the sea. Lake St. John, at the head of the Saguenay River, is about 350 feet above the sea. This lake is surrounded by terraced banks cut out of marine clays and sands, to elevations at least 200 feet above its surface. North of the lake, a wide sandy plain rises in successive terraces more than 200 feet above its level, and this plain extends some thirty miles beyond the northern limits of the lake to the foot of a rocky ridge that crosses the country in the vicinity of the Pimonka Rapid on the Chamouchouan River. Along this stream clay banks are found underlying stratified sands up to the Bear Portage, twenty miles above the mouth of the river and about 600 feet above the sea. Above this portage the level of the river is higher than that of the clays, and only stratified sand is seen in the scarped banks in the Pimonka Rapid at the thirty-fourth mile, where the river enters a narrow rocky valley extending to the Chaudière Falls. Terraces sixty feet above the level of the stream and about 700 feet above the sea, are met with along the walls of this gorge, but the evidence is not sufficiently strong for us to assert that they are of marine origin.

Lake St. John.

From the above evidence it will be seen that the post-glacial uplift of the Labrador Peninsula has not been equal around its coast, but that along its southern and western margin it was at least three times greater than along its north and east coast, where 200 feet appears to be the limit of raised marine terraces and beaches.

Unequal uplift of the peninsula.

APPENDIX I.

List of Mammalia of the Labrador Peninsula, with Short Notes on their Distribution, etc., by A. P. Low.

The following notes on the habits and range of the mammalia of Labrador, as far as refers to the interior, are largely the results of observations and information obtained during the recent explorations :—

Lynx Canadensis, Desmarest (Canada Lynx, Mountain Cat).—The lynx is commonly found within the wooded area, from the Atlantic coast to Hudson Bay. During the winter of 1893, many skins were taken in the valley of the Hamilton River. The number is said by the Indians and traders to vary with that of the rabbits which form the natural food of the lynx. When the rabbits are dying off after seasons of plenty, the Indians all say that the lynx does not breed, and only when the rabbits are again becoming plentiful do they again produce young. These animals are generally caught in dead-falls placed at the mouths of hollow logs.

Canis lupus, Linn. (Wolf).—The wolf is seldom met with in the southern regions since the extermination of the caribou there. It is now found only in the barren and semi-barren lands, where the caribou are still plentiful. A wolf was seen at the post at Northwest River, and a single skin was seen in the possession of an Indian on the upper Hamilton River ; the animal had been shot near Lake Michikamau. On the Hudson Bay coast, wolves were formerly plentiful, but of late years are quite rare.

Canis lupus, var. *albus*.—The White or Arctic Wolf is occasionally taken in the barren grounds, but does not appear to enter the timbered regions of the interior.

Canis familiaris, Say.—The Eskimo Dog is common along the coast everywhere, but south of Sandwich Bay the breed is much mixed. This animal plays an important part along the coasts, being used in the place of horses, or other animals for hauling. The methods of attaching the dogs to the sleds is different from that employed in the west, each dog having an independent trace, so arranged in length, that when the dogs are in line each one falls in behind another. The number of dogs in a team varies from four to thirteen. They are extensively used by the Eskimo and resident whites in travelling about the coast, and also for hauling wood, water and other loads. On ordinary 'roads' each dog will haul about 100 pounds, but when travelling on the crust, in the spring time, the load can easily be doubled or trebled.

Vulpes vulgaris, Fleming (Red, Cross, Silver and Black Fox).—These different animals are only colour varieties of the same species. On the Moose River, in 1887, the writer found a litter containing seven kits; of these two were red, three were cross and the remaining two black or silver—thus showing that the colour of foxes no more constitutes varieties than does the difference of colour in a litter of kittens of the common cat. There appears to be a greater proportion of dark-coloured foxes in the northern region than in the southern. The fox is found throughout Labrador from the St. Lawrence to Hudson Strait, where it is taken in the barrens and along the coast by the Eskimo. Most of the skins are taken before Christmas, as the fur becomes poor early in the spring.

Vulpes lagopus, Linn. (Arctic Fox, White Fox) is found most abundantly in the barren grounds. It is taken rarely south of Lake Michikamau or Nichicun. Along the seaboard the white fox ranges farther south, descending to the southern part of James Bay, and on the Atlantic coast being plentiful about Hamilton Inlet, but more rare southward to near the Strait of Belle Isle. Most of the foxes along the southern Atlantic coasts are said to be migrants from the northern coasts, and they are rarely caught south of Hamilton Inlet before that body of water is frozen over. The blue fox (var. *fuliginosus*) is much less abundant than the white, with which it is found. It is very rare along the southern half of the Atlantic coast.

Mustela Americana, Turton (Sable, Pine Marten).—The marten is one of the most abundant and valuable fur-bearing animals of Labrador. Its northern range is practically limited to the southern boundary of the semi-barrens, and it is found only in the wooded stretches of the river-valleys north of this line; north of the Big and Hamilton rivers, it is rarely found. The largest and darkest skins are taken along the edge of its northern limits, and on this account the skins bought at Fort George, Nichicun, Fort Chimo and Northwest River are much more valuable than those procured at the southern posts. The marten hunt is made after the smaller lakes set fast until December, and again during the months of March and April, after which the skins become poor.

Mustela Pennantii, Erxleben (Fisher, Pekan).—This animal only rarely enters the south-west limits of Labrador, not being known to occur east of Mingan, or north of Mistassini.

Putorius vulgaris, Linn. (Weasel).—Common everywhere south of the tree limit.

Putorius ermineus, Linn. (Ermine).—Common everywhere throughout the wooded regions.

Putorius vison, Brisson (Mink).—The mink is limited to the southern part of Labrador, and is only rarely found north of the East Main and Hamilton rivers. Not a single specimen was seen on the upper Hamilton River during the summer of 1894, and the Indians of that locality report it as rare. It is common on the lower river and about Hamilton Inlet. Several specimens were taken on the upper East Main River, but it is rare about Nichicun.

Gulo luscus (Linn.) Sabine (Wolverine, Carcajou).—Abundant throughout Labrador, especially in the northern portions, where it is taken by the Eskimo as far north as Hudson Strait. This animal is the personification of the devil among the Indians, owing to its cunning and destructive habits. Every Indian has wonderful stories to relate about the ferocity and intelligence of the wolverine. No câche of provisions or outfit is safe from the attacks of these animals, unless built up from the ground on high posts, in such a manner that the floors project and prevent the animals from reaching the sides or top. When a wolverine breaks into a câche, it not only eats the provisions, but breaks up and destroys other articles not fit for food. A wolverine in the vicinity of an Indian's hunting grounds, proves a very disagreeable neighbour, from its habits of following the hunter's tracks and either springing his traps and removing the bait, or else devouring the martens and other animals already caught. The wolverine is seldom caught itself, as its cunning is sufficient, after it has lost a few claws in the traps, not to put its feet in the set traps without first springing them by moving them about. When caught, they frequently gnaw off their foot above the trap and leave it, at other times they depart, taking trap and chain with them. In the fall of 1893, a wolverine carried away a trap from the Northwest River, and was taken a few days later in another trap on the Hamilton River, some thirty miles away from the place where it had picked up the first trap. The reason it was taken in the second trap, was because it could not obtain food while dragging the trap and chain through the bush, so, being reduced to starvation and hampered by the trap attached to its front leg, it was not able to spring the second one without being caught.

Mephitis mephitica, Shaw (Skunk).—Stearns says that it is rarely seen on the southern coast.

Lutra Canadensis, Turton (Otter).—The otter is common throughout the wooded region and ranges northward into the barren grounds. The skins taken in the northern regions have the darkest and most glossy fur. Very abundant on the upper Hamilton River, especially in the vicinity of the Grand Falls, where a number of Indian families congregate in the spring to hunt it.

Ursus arctos, Richardson (Barren-ground Bear).—There is no doubt that this species is found in the barrens of Labrador, as skins are brought in at intervals to Fort Chimo, and the Nascaupee Indians have numerous tales of its size and ferocity.

Ursus Americanus, Pallas (Black Bear).—The wooded country is the northern limit of this species, and it is most abundant in the southern regions in the burnt districts. Specimens were seen on the East Main River and about the Grand Falls on the Hamilton River. About Lake Winokapau and the lower Hamilton River bears are numerous. At Cambrian Lake, on the Koksoak River, the tracks of a large bear were seen along the shores, but it is not known whether these were those of a black bear or a barren-ground bear.

Thalassarctos maritimus, Linn (Polar Bear).—This species is as a rule confined to the coast and rarely travels inland, except to produce its young. At such time it is met with from twenty-five to fifty miles from the coast. On the Atlantic coast it is occasionally found as far south as the Strait of Belle Isle, whither it is carried from the north on ice floes. North of Hamilton Inlet, it is frequently met with along the coast and on the islands, being common about Cape Chidley and along Hudson Strait. During the winter of 1894 the tracks of three white bears were seen close to Northwest River, at the head of Hamilton Inlet, and a few specimens have been killed in that locality. In Hudson Bay, the white bear ranges southward to Charleton Island, near the south end of James Bay, in latitude 52°.

Odobaenus rosmarus, Malmgren. (Walrus).—This species, once common along the entire Labrador coast and the Gulf of St. Lawrence, is now found only on the Atlantic coast about and to the northward of Nachvak. It is common at all seasons in Hudson Strait, and along the northern Hudson Bay coast. Large numbers are killed by the Eskimo on the chains of outer islands which stretch southward to opposite Little Whale River off that coast.

Phoca vitulina, Linn. (Harbour Seal, Fresh-water Seal).—Common to the coast and low parts of the rivers all round Labrador. There are two or three large lakes inland near the head of the Stillwater Branch of the Koksoak River, but probably drained by the Nastapoka

River into Hudson Bay, where seals are reported by the Indians as plentiful. Another large lake inhabited by seals, is situated at the head of the north branch of the Northwest River, which flows into Hamilton Inlet. Skins in possession of the Indians, taken from these lakes, show that the seals belong to this species. According to the Indians, these animals never leave the lakes, and consequently have acquired a fresh-water habit.

Phoca foetida, Fabricius (Ringed Seal).—Along the whole Labrador coast. Commonest species in the Hudson Strait, and the principal food of the Eskimo.—(Tyrrell.)

Phoca Groenlandica, Fabricius (Harp Seal).—Very abundant along Labrador coast. Common on south shore of Hudson Strait. Common in Hudson Bay.

Erignathus barbatus, Fabricius (Bearded Seal, Square-flipper).—Rare on the St. Lawrence and southern Labrador coasts. Common about Nachvak, where the dog traces made from this skin are obtained for the southern Hudson's Bay Company's posts. A large specimen was seen at the head of tide, some sixty miles above the mouth of the Koksoak River. Common in Hudson Strait and Hudson Bay. Numbers seen about the Twin Islands in James Bay. Specimen obtained at the mouth of Moose River by Dr. R. Bell.

Halichœrus grypus, Fabricius (Gray Seal).—Rare along Atlantic coast, Hudson Strait and Hudson Bay.

Cystophora cristata, Erxleben (Hooded Seal).—Not common along the coasts of Labrador.

Delphinopterus catodon, Linn. (White Porpoise, White Whale).—Found everywhere along the coasts of the Labrador Peninsula from the St. Lawrence to the southern extremity of Hudson Bay. Fisheries for these animals are established in the mouths of the Koksoak, Leaf and Whale rivers flowing into Ungava Bay, and were formerly carried on at Great and Little Whale rivers on Hudson Bay. The whales are driven, as they ascend the river at high tide, into ponds inclosed by strong nets, and when the tide g es out they are either speared or shot in the shallow water.

Monodon monoceros, Linn. (Narwhal).—The "horns" of these animals are frequently brought to the Hudson's Bay posts by Eskimo from Hudson Strait and the north part of Hudson Bay.

Alce Americanus, Jardine (Moose).—It is very doubtful if this species enters the south-west limits of Labrador from the head-waters of the Ottawa River, where it is found abundantly.

Rangifer caribou, Linn. (Woodland Caribou).—Within the past twenty-five years the woodland caribou was plentiful throughout the southern wooded region, but now is practically exterminated on the southern watershed, being met only in small numbers about the heads of the rivers flowing into the eastern part of the Gulf of St. Lawrence. In 1892, along the route from Lake St. John to Mistassini, and from there to the mouth of the East Main River, not a single deer track was seen. In 1885, the last herd of seven caribou was killed in the vicinity of Lake Mistassini. A few woodland caribou are annually killed about the head-waters of the East Main River and Nichicun post. On the upper Hamilton River this species is still met with in small bands, but, according to the Indians the numbers at present killed are only a small percentage of the numbers annually slaughtered a few years past. This extermination of the caribou is very detrimental to the interior Indians, who in former times depended largely upon them both for food and clothing. Notwithstanding the quantity of flour now brought inland, and the fish caught and preserved for winter use, cases of starvation are of annual occurrence from the lack of animal food in place of the deer meat. In 1892, a deserted camp where a dozen persons had died of starvation two years previously, was passed on the East Main River. The survivors—a woman and a boy—told the usual tale of failure to find deer and consequent starvation. There appears to be no remedy for this except the abandonment of the interior by a large proportion of the Indians, with the total suppression of caribou hunting for a number of years. This is probably not practicable, and the Indians of the interior will consequently, it is feared, continue to die off.

The astonishing rate at which the fur-bearing and other animals multiply when undisturbed, was noted along the East Main River, where, owing to the death of Indians above mentioned, no hunt had been made for two years—and in that short interval the beavers had overstocked the small streams, and were common all along the main river.

Rangifer Groenlandicus, Linn. (Barren-ground Caribou, "Reindeer").—This species ranges in immense herds over the barren and semi-barren grounds. On the Atlantic coast, caribou of this variety are found south to the Mealy Mountains, a high barren range between Hamilton Inlet and Sandwich Bay. To the northward they are more or less common and at certain seasons of the year very plentiful about Davis Inlet and Nain. On the Hudson Bay coast they were formerly very abundant as far south as Cape Jones or the mouth of James Bay, but of late years they are found only in small numbers north of Great Whale River.

From information obtained from the Nascaupee Indians and others, the reindeer is believed to spend the summer season on the barren highlands near the coast, where the strong breezes keep down the pest of flies. In the autumn they migrate inland and southward into the semi-barrens, returning to the true barrens again in the months of April and May. In the northern part of the peninsula there appear to be three distinct herds, one on the Atlantic coast, that passes the summer on the highlands between Nachvak and Nain; a second, which crosses the lower part of the Koksoak River and summers on the west side of the Ungava Bay and Hudson Strait; and a third, which passes northward from the vicinity of Richmond Gulf and Clearwater Lake, and summers along the highlands of the north-east coast of Hudson Bay. Of late years, this last herd has become very small, and many of the Indians who lived on it have migrated from Hudson Bay to Fort Chimo, while the second herd was undiminished. The first herd supports the Indians living on the George River, and almost all from the Hamilton River. The principal hunt is made during the fall migration, when the bucks are fat and have not yet mated with the females. The Indians congregate along the George River, about a hundred miles beyond Lake Michikamau. They spread out along the river and await the crossing of the bands of deer on their way from the coast to the wooded country. As soon as a large body begins to cross, signals of smoke are made, and the Indians soon congregate and kill great numbers from their canoes by spearing them while in the water. The season for crossing lasts from ten to fifteen days. Much of the flesh is smoked for winter use, while the skins are preserved and dressed, either for clothing and other purposes or for sale. In the spring the deer migrate in small bands and are not so easily taken, as the snow and ice are then beginning to melt and they have to be killed by shooting after a chase. The migration of the second band is similar to that already described, except that during the fall migration small herds are continually crossing backwards and forwards along the river. Wide paths, caused by a single passage of the deer, were met with along the Koksoak River as far south as Cambrian Lake, and smaller paths as far as Lake Kaniapiskau, where a small number of the reindeer appear to remain throughout the summer. A couple of large paths were found on the Ashuanipi branch of the Hamilton River, and in the spring a number of tracks, made by small herds, were encountered below the Grand Falls. Periodically, the reindeer omit to return to the wooded areas from the barrens, and when this happens the Indians depending on them are left in a most lamentable condition, being largely without food and clothing. Many die of starvation in consequence unless outside aid is given. The death of over 150 persons along the Koksoak River during the winter of 1893, is but one of several such calamities which have happened during the last fifty years. In the evidence given before the committee of the Hudson's Bay Company, 1851, a letter was read from Wm. Kennedy as follows : "Starvation has, I learn, committed great havoc among our old friends the Nascopies, numbers of whom met their death from want last winter; whole camps of them were found dead, without one survivor to tell the tale of their sufferings."

Ovibos moschatus, Zimmermann (Musk Ox.)—There is no evidence to show that the musk ox was ever found in Labrador.

Vespertilio lucifugus, Leconte (Blunt-nosed Bat).—A small bat is common in the southern portion of the peninsula, having been seen on the Hamilton River and at Lake Mistassini, and it is supposed to be referable to this species.

Vespertilio subulatus, Say, is reported by Stearns from Natashquan.

Sorex personatus, Geoffroy St. Hilaire (*S. Cooperi*, Baird).—This small shrew was obtained at Sandwich Bay.

Sciuropterus volucella, Pallas, var. *Hudsonius*, Gmel. (Northern Flying Squirrel.—Common in the valley of the lower Hamilton River and about the head of Hamilton Inlet. Found at St. Augustine (Stearns).

Sciurus Hudsonius, Pallas (Red Squirrel).—Found throughout the southern wooded region as far north as the East Main River, and to the westward; on the Hamilton River from its mouth to Sandgirt Lake, and southward on the Attikonak Branch, but not along the Ashuanipi Branch.

Arctomys monax, Linn. (Woodchuck, Ground-hog).—Common in the country between Lake St. John and the East Main River, and on the Romaine River. Not seen on the Hamilton River, but said to be found about the head of Hamilton Inlet. "Common at Mingan, growing scarce towards Bonne Espérance" (Stearns).

Castor fiber, Linn. (Beaver).—Common in the wooded region and extending into the semi-barrens where food is found. On the Hudson Bay coast, rare north of Big River. In 1887 a specimen was killed in Richmond Gulf, latitude 56°. Charleton Island, in James Bay, was well-stocked with beaver introduced by the Hudson's Bay Company, but they were totally exterminated by wandering Eskimo in 1890. As before stated, beaver are very plentiful on the Lower East Main River. About Nichicun they are now more plentiful than formerly.

Common about the Lower Hamilton River and upwards to Sandgirt Lake, becoming very rare to the northward towards Lake Michikamau.

Hesperomys leucopus, Rafinesque (White-footed or Deer Mouse).—Common at Northwest River, Hudson's Bay post.

Arvicola riparius, Ord.—Specimen taken on Upper Hamilton River near Lake Petitsikapau. The Indians report a smaller species as not rare in the interior wooded country.

Cuniculus torquatus, Pallas. (Hudson Bay Lemming).—Common throughout the barren ground and southward to about latitude 54°. Specimen obtained from Lake Michikamau.

Zapus Hudsonius, (Zimmermann) Coues, (Jumping Mouse).—Not rare in the wooded region. Specimens taken at the mouth of the Hamilton River, near the Grand Falls, and on the Romaine River portages. The Indians who saw these specimens say that there is a much smaller species found in the interior, which closely resembles the larger, except in size.

Fiber zibethicus, Linn. (Muskrat).—Common in the southern-wooded region, but rare along the Upper Hamilton River.

Erethizon dorsatus, Linn. (Canada Porcupine).—Ranges from the St. Lawrence northward into the semi-barrens. Very plentiful along the Hamilton River, where it is largely used for food by the Indians. Common at Hamilton Inlet, and northward to Hopedale. Traces seen along the Great Whale River, and also on the Koksoak River, above Cambrian Lake.

Lepus timidus, Linn., var. *arcticus*, Leach. (Polar Hare).—Confined to the barren and semi-barren lands of Labrador. On the Hudson Bay coast a few are taken about Great Whale River. On the Atlantic they occur southward as far as Hamilton Inlet. A few are killed about Lake Michikamau.

Lepus Americanus, Erxleben (Hare, "Rabbit").—Found throughout the wooded region. Like the western rabbit, it is visited periodically with an infectious throat-disease, which about once in five years practically exterminates the animal. The disease apparently travels from the west towards the east and takes about two years to cross Labrador. The rabbit is largely used for food by the Indians, but is not sustaining, and they all say that on a diet of rabbits alone they rapidly become weak and unfit for work.

APPENDIX II.

List of Birds of the Interior of the Labrador Peninsula.

Urinator imber, Gunn. (Loon).—Common throughout the interior; breeds.

Urinator lumme, Gunn. (Red-throated Loon).—Common on upper Hamilton River and Koksoak River; breeds.

Urinator arcticus, Linn.—Seen June 3rd at Lake Mistassini; not common.

Uria troile, Linn. (Murre).—Common in open water of Hamilton Inlet until January 20th, 1894.

Alle alle, Linn. (Dovekie).—Very common in Hamilton Inlet until January 20th, 1894. Numbers of this and the preceding found frozen in bushes along the edge of the open water.

Gavia alba, Gunn. (Ivory Gull).—Specimen obtained at Rigolet, where it was shot during the winter; seen at Northwest River late in December after the inlet was frozen; not common.

Larus glaucus, Brunn. (Glaucous Gull).—Common throughout the interior; seen May 19th; eggs June 14th.

Larus Delawarensis, Ord.—Nests at Mistassini Lake; seen June 11th.

Sterna Forsteri, Nutt. (Forster's Tern).—Common throughout interior; seen June 13th, Hamilton River, June 1st, Mistassini.

Merganser Americanus, Cass. (American Merganser).—Common throughout interior; seen May 28th; eggs June 25th.

Merganser serrator, Linn. (Red-breasted Sheldrake).—Abundant throughout the interior; seen May 28th; eggs June 25th.

Anas obscura, Gmel. (Black Duck).—Not common throughout the interior; seen May 1st; eggs May 23rd.

Glaucionetta clangula Americana, Bp. (American Golden-eye).—A few flocks seen on upper Hamilton River during June; seen at Mistassini May 3rd.

Somateria spectabilis, Linn. (King Eider).—One specimen killed at Lake Mistassini.

Oidemia Americana, Sw. and Rich. (American Scoter).—Common on Hamilton River, May and June, in migration; seen May 26th.

Oidemia perspicillata, Linn (Surf Duck).—Common on Hamilton River during migration, May and June; seen May 26th.

Branta Canadensis, Linn. (Canada Goose).—Breeds in marshes throughout the northern interior, and is seen along the rivers with young broods about July 1st; seen at Mistassini May 2nd, at Grand Falls, Hamilton River, May 4th. From the journals of the Hudson's Bay Company, the average date of first arrival at Lake Winokapau and Northwest River, is May 10th; several large broods seen on Burnt Lakes, Romaine River; not common at Lake Mistassini, but abundant on East Main River—especially on lower part, where the river is cut out of clays, with good bottom-lands; breeds in large numbers on the islands of James Bay.

Branta bernicla, Linn. (Brant).—Very rare in the interior; one sick killed at Mistassini July 2nd. If these birds cross Labrador in their northern migration, they fly high and only rarely rest, as the Indians, who know them well on the St. Lawrence coast, report them very rare in the interior.

Nycticorax nycticorax nævius, Allen (Black-crowned Night-Heron).—Single specimen at Lake Mistassini, August 6th.

Phalaropus lobatus, Linn. (Northern Phalarope).—Seen on upper Hamilton River, June 13th. Not common.

Gallinago delicata, Ord. (Wilson's Snipe).—Male heard and seen at Lake Petitsikapau, Hamilton River, June 28th.

Tringa minutilla, Vieill. (Least Sandpiper).—Common about Upper Hamilton River. Breeds.

Totanus melanoleucus, Gmel. (Greater Yellow Legs).—Met with occasionally throughout the interior. Breeds. Seen May 31st.

Totanus flavipes, Gmel. (Yellow Legs).—Seen only after August 1st, on Hamilton River and at Mistassini.

Totanus solitarius, Wils. (Solitary Sandpiper).—Common throughout the interior, especially south of latitude 54°. Breeds. Seen May 27th. Eggs June 19th.

Actitis macularia, Linn. (Spotted Sandpiper).—Common along the upper Hamilton River. Seen May 27th. Eggs June 20th.

Ægialitis semipalmata, Caban. (Semipalmated Plover).—Common on Upper Hamilton River. Seen June 16th. Breeds.

Dendragapus Canadensis, Linn. (Canada Grouse, Spruce Partridge).—Common throughout wooded and in the semi-barrens. Eggs June 1st.

Bonasa umbellus togata, Linn. (Ruffed Grouse, "Partridge." Birch Partridge).—Common at Mistassini. Not rare at mouth of Hamilton River. Not found on Upper Hamilton River.

Lagopus lagopus, Linn. (Willow Ptarmigan).—Common throughout the winter.. Breeds on Upper Hamilton River. Eggs June 25th.

Lagopus rupestris, Gm. (Rock Ptarmigan).—Common in valley of Hamilton River during winter. Leaves for northward about April 15th.

Ectopistes migratorius, Linn. (Passenger Pigeon).—Very rare. Eggs obtained at Fort George, 1887.

Accipiter atricapillus, Wils. (American Goshawk).—Specimen killed near Cambrian Lake, Koksoak River; also on lower Hamilton River. Not common.

Aquila chrysaetos, Linn. (Golden Eagle).—Breeds at head of Lake Michikamau. Seen in several places along upper Hamilton River.

Halidetus leucocephalus, Linn. (Bald Eagle).—A pair seen on Hamilton River below Grand Falls, April 28th. White heads distinctly seen.

Falco rusticolus obsoletus, Gmel. (Labrador Gyrfalcon).—Specimen shot at Cape Chidley.

Falco peregrinus anatum, Bon. (Duck Hawk).—Not uncommon throughout the interior.

Pandion halidetus Carolinensis, Gm. (Osprey).—Common throughout southern interior, to lat. 54°. Seen May 27th. Eggs June 12th. Nest on top of large white spruce.

Asio accipitrinus, Pall. (Short-eared Owl).—Seen on Upper Hamilton and Romaine rivers.

Nyctale Acadica, Gmel. (Saw-whet Owl).—Specimen shot near Lake Mistassini.

Bubo Virginianus saturatus, Ridgw. (Dusky Horned Owl).—Common about Northwest River during winter. Common in the interior.

Surnia ulula caparoch, Müll. (American Hawk Owl).—Seen several times on Upper Hamilton River.

Ceryle alcyon, Linn. (Belted Kingfisher).—Was not found north of the vicinity of the Grand Falls, Hamilton River. Common on Romaine River and at Lake Mistassini. Seen May 30th.

Dryobates villosus leucomelas, Bodd. (Hairy Woodpecker).—Shot in valley of Hamilton River in March. Not rare.

Dryobates pubescens, Linn. (Downy Woodpecker).—Common on Hamilton River throughout the year.

Picoides arcticus, Swains. (Black-backed Three-toed Woodpecker).—Common along Lower Hamilton River.

Colaptes auratus, Linn. (Yellow-shafted Flicker).—Single specimen seen near Grand Falls, Hamilton River, 30th May.

Chordeiles Virginianus, Gmel. (Night-hawk).—Very rare on Upper Hamilton River. Single specimen seen near the Grand Falls, May 31st. Common at Mistassini and along Romaine River.

Empidonax flaviventris, Baird. (Yellow-bellied Fly Catcher).—Common at Lake Mistassini. Not seen at Hamilton River.

Otocoris alpestris. Linn. (Horned Lark).—Common on barrens of Upper Hamilton River and about Lake Michikamau.—Eggs June 19th.

Perisoreus Canadensis, Linn. (Canada Jay).—Very common throughout the interior. Nest with four eggs taken at Rigolet March 24th, 1894; and another at North-west River, with three eggs, about the same date. Young able to fly from nest on May 18th, at Grand Falls, Hamilton River.

Perisoreus Canadensis nigricapillus, Ridgw. (Labrador Jay).—Abundant throughout northern interior.

Corvus corax principalis, Ridgw.—Common throughout the interior. Resident.

Molothrus ater, Gray. (Cowbird).—Common at Lake Mistassini.

Scolecophagus Carolinus, Müll. (Rusty Black Bird).—Common throughout the interior.

Pinicola enucleator, Linn. (Pine Grosbeak).—Common on the Upper Hamilton River. Male seen May 1st.

Loxia leucoptera, Gmel. (White-winged Cross-bill).—Common on Hamilton River in March and April.

Acanthis linaria, Linn. (Common Redpoll).—Abundant about the Hamilton River.

Plectrophenax nivalis, Linn. (Snow Bunting).—Plentiful on Hamilton River in early spring.

Calcarius Lapponicus, Linn.(Lapland Longspur).—Common on Hamilton River in early spring.

Ammodramus Sandwichensis Savanna, Wils. (Savannah Sparrow).—Very common on upper Hamilton River. Eggs June 24th.

Zonotrichia Leucophrys, Forst. (White-Crowned Sparrow).—Very common on upper Hamilton River. Seen May 16th. Eggs June 25th.

Zonotrichia albicollis, Gmel. (White-throated Sparrow).—Common at Lake Mistassini. Heard at Grand Falls, Hamilton River. Common on the Romaine River.

Spizella monticola, Gmel. (Tree Sparrow).—Common everywhere in Labrador. Breeds in great numbers on upper Hamilton River. Seen May 31st; eggs June 21st.

Junco hyemalis, Linn. (Black Snow-bird).—Common at Lake Mistassini and upper Hamilton River. Seen May 29th. Eggs June 27th.

Melospiza fasciata, Scott (Song Sparrow).—Common at Lake Mistassini.

Tachycineta bicolor, Vieill. (White-bellied Swallow).—Common throughout the interior. Seen May 25th.

Ampelis cedrorum, Vieill. (Cedar Wax-wing).—Rare at Lake Mistassini.

Lanius borealis, Vieill. (Great Northern Shrike).—Common on Hamilton River; seen April 16th.

Helminthophaga peregina, Wils. (Tennessee Warbler).—Not rare at Lake Mistassini.

Dendroica æstiva, Gmel. (Yellow Warbler).—Common at Lake Missassini; seen near Grand Falls, Hamilton River, May 31st.

Dendroica coronata, Linn. (Myrtle Warbler).—Specimen from Grand Falls, Hamilton River, May 31st.

Dendroica maculosa, Gmel. (Magnolia Warbler).—Not rare at Lake Mistassini.

Dendroica striata, Forst. (Black-poll Warbler).—Common on upper Hamilton River. Seen May 31st.

Seiurus Noveboracensis, Gmel. (Water Thrush).—Common about Grand Falls, Hamilton River. Seen May 31st.

Sylvania pusilla, Wils. (Black-capped Yellow Warbler).—Seen near Grand Falls, Hamilton River, May 31st. Not rare at Lake Mistassini.

Parus Hudsonicus, Forst. (Hudsonian Chickadee).—Abundant on Hamilton River from April 1st.

Regulus satrapa, Licht. (Golden-crowned Kinglet).—Common on Hamilton River between Grand Falls and Sandy Lake; rare to northward; seen May 19th.

Regulus calendula, Linn. (Ruby-crowned Kinglet).—Very common along Hamilton River between Grand Falls and Sandy Lake. Seen May 29th.

Turdus ustulatus Swainsonii, Caban. (Olive-backed Thrush).—Very common along the upper Hamilton River. Seen May 16th. Eggs June 30th.

Turdus Aonalaschkæ Pallasii, Caban. (Hermit Thrush).—Not rare at Lake Mistassini.

Merula migratoria, Linn. (American Robin).—Abundant throughout the interior. Seen May 10th. Eggs June 13th.

APPENDIX III.

LIST OF THE PRINCIPAL FOOD FISHES OF THE LABRADOR PENINSULA, WITH SHORT NOTES ON THEIR DISTRIBUTION.

Petromyzon (sp.)—A small Lamprey was taken on the Bersimis River a few miles below Lake Pipmaukin, 1884, adhering to a large brook trout.

Accipenser (sp.)—A species of Sturgeon is very plentiful in the Rupert River, being taken in large quantities at Lake Nemiskau, where the Indians congregate and dry the fish during September. The fish here are usually under three feet in length. Also abundant in the river from Lake Nemiskau to its mouth. Common in the East Main River, from its mouth to Conglomerate Gorge. Also found in the lower part of the George River and in the Nottaway at Lake Obatogaman, near its head.

Catostomus longirostris, LeSueur (Long-nosed Sucker, Northern Sucker).—Common in rivers and lakes throughout the interior. The principal food of the Indians in many parts of Labrador.

Catostomus Forsterianus, Richardson. (Red Sucking Carp, Red Sucker).—This is usually regarded as a variety of the above, but Sir John Richardson gives it as a distinct species, and the fish found in Labrador is quite distinct in shape, size of scales and colour, from the first-named sucker. It is at least two weeks later on the spawning beds. Common throughout the interior. Preferred by the Indians for food to the gray sucker. Average weight of both species about 5 pounds.

Osmerus mordax (Mitchill), Gill. (American Smelt).—Common at the mouth of the Northwest River, Hamilton Inlet, where it is abundantly taken in November and the early part of December.

Coregonus clupeiformis (Mitchill), Milner (Common Whitefish).—Found abundantly throughout the interior, in lakes and rivers. Largest fish taken in Lake Mistassini, 14 pounds weight. Average weight 3 or 4 pounds. A small species of whitefish closely resembling the common whitefish is caught in abundance in the shallow salt water along the east coast of James Bay. These fish ascend the rivers of James Bay during the autumn months along with sea trout.

Salmo salar, Linn. (Common Atlantic Salmon).—Abundant in the rivers of the St. Lawrence and the Atlantic coasts and also in the rivers flowing into Ungava Bay. Reported by Dr. R. Bell, as taken by Eskimo at Stupart Bay, at the western side of Ungava Bay or Hudson Strait. The salmon enter the rivers of the St. Lawrence coast early in June, are taken in Hamilton Inlet in July, but do not ascend the Koksoak and other rivers of Ungava Bay until about the middle of August. From this there would appear to be some connection between the time at which the fish strike into the rivers and the temperature of the water along the coast, that to the northward rising more slowly than the southern waters; or else the fish follow northward along the coast and take at least two months to pass from the Strait of Belle Isle to Ungava Bay. There is no evidence, however, to show that the fish thus follow the coast. The time at which the salmon enter Ungava Bay from the Atlantic and the absence of this species from Hudson Bay, would seem to show that the waters of the western part of Hudson Strait do not rise sufficiently in temperature to allow the salmon to enter Hudson Bay in time to ascend its rivers before the spawning season, and this is the probable cause why no Atlantic salmon have been are found in its rivers.

The land-locked variety of *S. salar*, or ouinaniche, is found in Lake St. John and the tributaries of the Saguenay River, where it has free access to the sea, but as the same fish was found plentifully in both branches of the Hamilton River, above the Grand Falls with its sheer drop of 300 feet, it is certainly land-locked there. It is also common in the Koksoak River below Lake Kaniapiskau, above perpendicular falls of eighty feet and sixty feet. Common in Lake Michikamau on the head of the Northwest River. It is also reported by the Indians as numerous in the upper George River, the Romaine River, the Manicuagan and several other of the rivers flowing into the Gulf of St. Lawrence. It has not yet been reported from the rivers of the western watershed. Average weight of the fish caught, not above three pounds. The Indians report that the largest in the Hamilton River do not exceed ten pounds in weight.

Salmo Hearnii, Richardson (Hearne's Salmon).—A small salmon, with bright red spots on its sides, is found along the northern east coast of Hudson Bay, and probably belongs to this species. Its southern limit is a small river a few miles south of Cape Jones. It is taken in nets set in the salt water near Long Island, just north of Cape Jones, and also in some small streams flowing into Richmond Gulf. The Eskimo also report it common in some of the rivers north of Richmond Gulf.

Salvelinus namaycush (Walbaum), Goode (Great Lake Trout).—Very plentiful in all the larger lakes of the interior northward to Hudson

Strait. Very abundant in the lake-expansions of the Hamilton River and Lake Michikamau. Average weight about 8 pounds, but many taken more than 25 pounds in weight.

Salvelinus fontinalis (Mitchill), Gill and Jordan (Brook Trout).—This fish is abundant in many of the rivers and lakes of the Labrador Peninsula. Sea-run fish of this species are plentiful along the shores and lower parts of the rivers from the St. Lawrence to the southern part of James Bay. On the Atlantic coast and Ungava Bay, they are particularly plentiful and of large size. Along these coasts the mouth of every river swarms with trout during the late summer and autumn. The largest fish reported was taken at Nachvak and weighed fourteen pounds. In the Koksoak and George rivers, the average weight of the sea-run trout is about seven pounds. In Hamilton Inlet, there is less change in the sea-run fish than along the coast. At Northwest River the fish are small and do not average over one pound in weight. Here they were freely taken with a fly, up to the middle of December, when the mouth of the river was frozen over. In the mouth of the Hamilton River, sea-run trout average about three pounds in weight.

In James Bay, the trout taken along the coast and in the lower parts of the rivers are generally small and do not exceed two pounds in average weight. Between the lowest falls and the upper waters of the western rivers, brook trout are rarely taken, but in the northern, eastern and many of the southern rivers they are abundant along their entire length.

In the Koksoak River, for a few miles below Lake Kaniapiskau, large trout were abundant, but lower down they became smaller, until the sea-run fish were met with. On the Hamilton River, below the Grand Falls, the trout do not average over one pound in weight. Above the falls, the fish are much larger, and average more than three pounds in weight, while fish of five pounds and seven pounds are common. On the Romaine River, no trout were taken until the Burnt Lakes were passed, when they became plentiful, though small. Outside of the rivers and small streams, this species is found abundantly in most of the numberless lakes throughout the interior. Two varieties are met with everywhere; one has pink flesh, the other yellow, the former having the finest flavour.

Esox lucius, Linn. (Pike).—This fish is found abundantly throughout the interior in the lakes and quiet-flowing streams; common on the rivers of the southern, eastern and western watersheds; not so abundant in the Koksoak River. It varies in weight from two to fifteen pounds.

Anguilla (Sp).—The Indians report eels as common in the upper Romaine River.

Stizostedium vitreum (Mitchill), Jordan and Copeland (Wall-eyed Pike, Doré, "Perch" of the Hudson Bay Co).—Common in the southern rivers flowing into Lake St. John and to the westward, also in the Rupert and East Main rivers of the western watershed. Rare in the Betsiamites River, and not found east of that stream, being unknown to the Indians of Mingan. Not found in the Big River, or streams to the north of it, nor in the rivers of the eastern or northern watersheds. Average weight, three pounds.

Lota maculosa (Le Sueur), Cuvier and Valenciennes (Ling, LaLoche, Maria).—Common in all the deep lakes throughout the interior. An important source of food for the Indians, owing to its taking bait freely during the winter months, when other fish cannot be caught. Weight, two pounds to fifteen pounds.

Gadus callarias, Linn. (Common Cod-fish).—Plentiful along the St. Lawrence and Atlantic coasts to Cape Chidley, also along the east shore of Ungava Bay to the mouth of George River. The following abstract from the Census of Newfoundland (1891) will show the extent and value of the cod-fishing of the Atlantic coast:—

"10,478 men, 2081 women and 828 children were employed in the fishery in 861 vessels, of which the tonnage amounted to 33,689 tons. The total catch of codfish amounted to 488,788 quintals." Fishing beyond Cape Chidley, along the east coast of Ungava Bay, was not undertaken until 1893, when a Newfoundland steamer was so successful that in 1894 two steamers and three schooners made successful catches in the neighbourhood of Port Burwell. The Eskimo report cod as being plentiful about the mouth of George River in the month of August. It is at present unknown whether this fish enters Hudson Bay, and it is a question which should speedily be settled by a properly equipped vessel, as valuable fisheries in the northern part of that great body of water may be lying idle for want of proper information concerning them.

APPENDIX IV.

List of Insects collected in the Interior of the Labrador Peninsula, 1894. Determined by Dr. Jas. Fletcher, Dominion Entomologist.

LEPIDOPTERA.

Argynnis Atlantis, Edw	16th July	1	specimen.
" *Chariclea*, Ochs	16th July	6	"
" *Triclaris*, Hbn	8th to 16th July	4	"
Chionobas Jutta, Hbn		1	"
Lycæna Lucia, Kirby	26th to 28th May	5	"
Colias Scudderii, Reak	20th to 27th July	7	"
Papilio Turnus, L.	10th July	4	"
Pyrgus Centauriæ, Ramb.	18th June to 16th July	7	"
Laria Rossii, Curtis	12th May	2	"
Rheumaptera hastata, L.	20th July		
Agrotis (?)	19th July		

COLEOPTERA.

195.	*Nebria Sahlbergi*, Fish	1	specimen.
206.	*Pelophila Ulkei*, Horn.	5	"
	Agabus (?)		
	Pterostichus (?)		
1706.	*Silpha Lapponica*, Hbst	2	specimens.
1490.	*Dytiscus dauricus*, Gebl	2	"
3059.	*Coccinella transversoguttata*, Fab	2	"
4787.	*Eros aurora*, Hbst	1	"
4901.	*Podabrus piniphilus*, Esch	1	"
6273.	*Acmæops proteus*, Kirby	2	"
6452.	*Pogonocherus penicellatus*, Lec	1	"
6557.	*Syneta ferruginea*, Germ	1	"
6843.	*Gonioctena pallida*, L	2	"

Note.—Insect life is not abundant in the interior of the Labrador Peninsula, and the above list probably represents over half of the species of Lepidoptera and Coleoptera commonly found about the region drained by the upper Hamilton River. A few more butterflies were seen of which specimens could not be obtained, but in all they did not make more than three or four extra species.

APPENDIX V.

Notes on the Microscopic Structure of some Rocks from the Labrador Peninsula.

BY

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INTRODUCTORY REMARKS.

The following notes on a series of thirty-four rock specimens, collected by Mr. A. P. Low in the Labrador Peninsula, in 1893, 1894 and 1895, are offered as a contribution to our knowledge of the petrography of that little-known country.

It must be understood, however, that the proportions in which the various rock types occur in the collection do not in any sense represent the relative frequency of occurrence of these types in the field. Only such specimens as were of a doubtful character, or had some special points of interest attaching to them, were selected by Mr. Low for microscopic examination.

Of the thirty-four specimens examined, some fourteen are undoubted diabases and gabbros of varying degrees of freshness. Eight others, now mainly dioritic, have probably been derived from similar rocks by alteration. One specimen (23) was apparently originally a diorite. Three hornblende-schists or amphibolites (4, 16, 17) have been, without doubt, produced by the crushing and shearing of basic eruptives.

Three of the diabases (32, 33, 34) have been already described by Mr. A. E. Barlow,* and are of interest as containing decomposed porphyritic crystals of plagioclase very similar to the "Huronite" of Dr. Thompson.† Among the gneissic rocks the interesting hypersthene syenite gneiss (6) may be specially noted.

The granites, quartz porphyries and syenites are not numerous in the collection, the two former being represented by a single specimen each (19, 5), and the latter by two specimens (6, 21).

* On some Dykes containing Huronite. Ottawa Naturalist, vol. IX., No. 2, 1895.
† Thompson's Mineralogy, I., p. 384, 1836.

The beautifully fresh felspar-free pyroxenite or hypersthenite (13) is worthy of special mention as an excellent example of these rocks, which have seldom been met with in Canada.

The white anorthosite (24) is a typical example of its class, and closely resembles those described by Dr. Adams from the Saguenay and Morin areas of Norian rocks.

Rocks of clastic origin are represented in the collection by a fine-grained greywacke (9) which, in the hand specimen, might readily be taken for an eruptive, and a much altered specimen (1) which may possibly be an ash-rock.

The literature of the subject is not very extensive, and those papers which enter into details regarding the rocks deal chiefly with the anorthosites.

A list of the principal papers and books which have appeared, taken, with some additions and alterations, from Dr. Adams's paper on the Norian rocks of Canada,* is here appended :—

Adams, F. D.:—

Ueber das Norian oder Ober-Laurentian von Canada. Stuttgart, 1893; also translation of same in Canadian Record of Science, Vol. VI., 1895.

Barlow, A. E.:—

On some Dykes containing Huronite. Ottawa Naturalist, Vol. IX., No. 2, 1895.

Baddeley, Lieut. (F. H.):—

Geology of a portion of the Labrador Coast. Trans. Lit. and Hist. Soc. of Quebec, Vol. I., 1829.

Bayfield, Capt. :—

Notes on the Geology of the North Coast of the St. Lawrence. Trans. Geol. Soc., London, Vol. V., 1833.

Bell, Robert :—

Observations on Geology, Mineralogy, Zoology and Botany of the Labrador Coast, Hudson's Bay and Strait. Ann. Rep., Geol. Surv. Canada, 1882-84.

The Labrador Peninsula. The Scottish Geographical Magazine, Vol. XI., No. 7, 1895.

Cayley, Ed.:—

Up the River Moisie. Trans. Lit. and Hist. Soc. of Quebec, Vol. V., 1862.

*Ueber das Norian oder Ober-Laurentian von Canada, Stuttgart, 1893: also translation in Canadian Record of Science, vol. VI., 1895.

Cohen, E.:—

Das Labradorit-führende Gestein der Küste von Labrador. Neues Jahrb. für Min., 1885, I., p. 183.

Davies, W. H. A.:—

Notes on Esquimaux Bay and the surrounding Country. Trans. Lit. and Hist. Soc. of Quebec, Vol. IV., 1843.

Hind, H. Y.:—

Observations on Supposed Glacial Drift in the Labrador Peninsula, etc. Q. J. G. S., Jan., 1864.

Explorations in the Interior of the Labrador Peninsula. London, 1863.

Jannasch, P.:—

Ueber die Löslichkeit des Labradors von der Paulinsel in Salzsäure. Neues Jahrb. für Min., 1884, II., p. 42.

Lieber, O. M.:—

Die amerikanische astronomische Expedition nach Labrador, im Juli, 1860. Peterm. Mitth., 1861.

Low, A. P.:—

On the Mistassini Expedition. Ann. Rep., Geol. Surv. Canada, 1885, Part D.

The Recent Exploration of the Labrador Peninsula. Canadian Record of Science, Vol. VI., No. 3, 1894.

Packard, A. S.:—

The Labrador Coast. London, 1861.

Observations on the Glacial Phenomena of Labrador and Maine, etc. Mem. Boston Soc. Nat. Hist., Vol. I., 1865.

Observations on the Drift Phenomena of Labrador. Canadian Naturalist (New Series), Vol. II., 1865.

The Labrador Coast. London, 1891.

Puyjalon, H. de :—

Report on the Copper, etc., found to exist on the North Shore of the Gulf of St. Lawrence. Report of Com. of Crown Lands, Province of Quebec, 1883.

Report of Exploration for minerals on North Shore of the Gulf of St. Lawrence. Report of Com. of Crown Lands, Province of Quebec, 1884.

These two reports contain references to the anorthosites, syenites and other rocks of the region.

Reichel, L. J.:—

Labrador, Bemerkungen über Land and Leute. Peterm. Mitth 1863.

Richardson, J.:—

The Geology of the Vicinity of Lake St. John. Rep. Geol. Surv. Canada, 1857.

The Geology of the Lower St. Lawrence. Rep. Geol. Surv. Canada, 1866-69.

Roth, J.:—

Ueber das Vorkommen von Labrador. Sitz. Berlin. Akad. XXVIII., p. 697, 1883.

Selwyn, A. R. C.:—

Summary Reports of the Geol. Surv. Canada, for 1879-80 and 1889.

Selwyn, A. R. C., and Dawson, G. M.:—

Descriptive Sketch of the Dominion of Canada. Published by Geol. Surv. Canada, 1882.

Steinhauer, M.:—

Note relative to the Geology of the Coast of Labrador. Trans. Geol. Soc., London, Vol. II., 1814.

Van Hise, C. R.:—

Correlation Papers, Archæan and Algonkian. Bull. U. S. Geol. Surv., No. 86, p. 398, 1892.

Vogelsang, H.:—

Sur le Labradorite Coloré de la Côte du Labrador. Archives Néerlandaises, T. III., 1868.

Van Werveke, L.:—

Eigenthümliche Zwillingsbildungen am Feldspath und Diallag. Neues Jahrb. für Min., 1883, II., p. 97.

Wichmann, A.:—

Ueber Gesteine von Labrador. Zeitschr. d. d. Geol. Ges., 1884, p. 486.

Wilkins, D. F. H.:—

Note on the Geology of the Labrador Coast. Canadian Naturalist (New Series), Vol. VIII., 1878.

Williams. G. H.:—

Describes Porphyritic Diabase or Diabase Porphyrite from Nachvak, and Hornblendic Pyroxenite from near Skynner's Cove, Nachvak, Labrador. Ann. Rep., Geol. Surv. Canada, Vol. V., Part I., 1890-91. Part F., Appendix I., Nos. 38 and 43.

DESCRIPTIONS OF THE ROCKS.

1. Ash Rock?—Outlet of Dyke Lake, Ashuanipi Branch, Hamilton River.

A dark coloured, fine-grained rock, having an amygdaloidal appearance, due to embedded rounded little masses of crystalline calcite with some harder mineral stained red.

The rock exhibits imperfect partings and has porphyritically-developed bisilicates scattered through it, now much decomposed.

Under the microscope it is seen to be composed of a confused mass of secondary iron ore, chlorite, epidote, calcite, etc., with some small, quite fresh, porphyritic hornblende crystals, which have good cleavage and somewhat sharp crystal outlines.

Owing to the extreme alteration of nearly all its constituents, it is impossible to refer the rock with certainty to any particular type, but I am inclined to think that it may be a bedded ash rock.

2. Uralitic Gabbro, or Gabbro Diorite.—Great Bend, East Main River.

A dark green, fine-grained, laminated rock, somewhat mottled with white calcite, and having pyrite plentifully scattered through it.

In the thin section it is seen to be much altered, squeezed, and sheared, producing very uneven extinction in its constituent minerals.

It possesses a crystalline granitic structure, and consists chiefly of plagioclase, hornblende, magnetite, quartz, pyrite, apatite, epidote and chlorite.

The plagioclase is in allotriomorphic individuals which are almost entirely saussuritized, but still retain traces of the original twinning striation, and are frequently penetrated by slender little crystals of apatite.

The hornblende, which has every appearance of being secondary in origin, is the "compact"* variety so characteristic of those rocks which have been subjected to metamorphism. It is green in colour and strongly pleochroic, with $\mathfrak{a}$ = greenish-yellow, $\mathfrak{b}$ = yellowish-green, and $\mathfrak{c}$ = bluish-green. Teall† has pointed out that this development of hornblende at the expense of augite or diallage in basic igneous rocks in regions not affected by contact metamorphism, is one of the most definitely established facts in petrographical science.

The hornblende of this rock occurs in irregular aggregates of grains having no uniform orientation. Some quartz, apparently secondary, much cracked, and with very uneven extinction, is present, and pyrite is exceedingly abundant.

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* That is, homogeneous, neither fibrous, nor actinolitic.
† British Petrography, 1888, p. 161.

This combination of saussurite and secondary "compact" hornblende, as the result of the alteration of gabbros, is very characteristic and has frequently been described.

3. Diabase, highly altered.—Head of Dyke Lake, Ashuanipi Branch, Hamilton River.

A dark gray, fine-grained, rusty-weathering rock, holding numerous small white oval patches, consisting chiefly of calcite, which give it a decidedly porphyritic appearance. Smaller, dark coloured porphyritic forms also occur, which were probably augites.

On weathered surfaces the rock has a cavernous appearance, due to the removal of the calcite in the oval areas referred to above.

As seen in the thin section, the rock is much altered and filled throughout with crystalline calcite.

Small, interlacing, lath-shaped crystals of plagioclase make up the bulk of the section, giving to it a decided ophitic structure, and it is thickly sprinkled with little granules of secondary iron ore and scales of chlorite. Comparatively large patches of calcite and chlorite represent what were probably originally phenocrysts of plagioclase and augite.

The rock is apparently a much altered and highly calcareous diabase.

4. Hornblende Schist, probably resulting from the shearing of some basic eruptive.—Jacopie Lake, Hamilton River.

A rather light green, fine-grained, glossy, chloritic schist, with intercalated red felspathic layers, and very wavy and crinkled lamination.

Microscopic examination shows that it has been subjected to intense shearing action, the hornblende being all pulled-out, and the larger plagioclase fragments occurring in elongated streams of finely-granulated material of the same kind.

The principal minerals present are hornblende, felspar (both striated and non-striated), chlorite, epidote, a little quartz, and a very little iron ore and titanite.

Streaks of finely-granulated felspar, evidently derived from the breaking-up of larger individuals, fragments of which still occur distributed through the granulated material, alternate with wavy streaks of hornblende pulled-out in the same manner from larger individuals. These hornblende layers wind around the larger fragments of felspar in such a manner as to give a regular "flow-structure" to the section.

In one instance a large felspar individual lies almost at right angles to the general direction of lamination of the rock, and the hornblende layers bend around it in a most marked manner.

Both twinned and untwinned felspar grains occur, but the former are more plentiful. Inclusions are very common.

The hornblende is compact, except where it has been excessively drawn-out by the shearing action to which the rock has been subjected. It is now generally of pale yellowish or bluish-green tints, owing to chloritization, possesses well-marked cleavages, and rather feeble pleochroism.

The rock may be regarded as a greatly sheared and crushed basic eruptive, perhaps a diorite.

5. Crushed Quartz Porphyry.—Mouth of Akuatago River, East Main River.

In the hand specimen this is a medium-grained rock of a somewhat dark gray colour, mottled with whitish phenocrysts of quartz and felspar, and with a lamination due to shearing. Many of the quartz phenocrysts exhibit a bluish opalescence. Pyrite and calcite are plentiful, the rock effervescing freely with dilute hydrochloric acid. The thin section shows a micro-granitic groundmass composed of quartz and felspar, in which lie numerous phenocrysts of quartz and felspar, the former frequently having a rude dihexahedral form, and the latter being mainly non-striated and probably orthoclase.

Biotite in irregular scales and aggregates, accompanied by some muscovite, is abundant. A little hornblende is present, and pyrite, epidote, chlorite, titanite, zircon, and apatite also occur.

The rock has been greatly crushed and sheared; the phenocrysts of both quartz and felspar possess very uneven extinction, are much cracked, and peripherally granulated.

The felspar is decomposed and filled with carbonates, epidote, muscovite, and other alteration products. A few slender needle-like crystals of an intensely pleochroic (indigo-blue to light yellow or almost colourless) mineral resembling tourmaline were observed. The biotite is largely altered to chlorite. Some of the epidote possesses the low double refraction of zoisite. The rock may be regarded as a much crushed and sheared quartz porphyry. Only small portions of it have resisted the crushing action.

6. Hypersthene Syenite Gneiss.—First Gorge of the Koksoak River.

A rather coarse-grained, greenish-gray, gneissic rock, with granitic structure, and consisting chiefly of a non-striated felspar, a little quartz, an orthorhombic pyroxene strongly pleochroic in light-green and pink tints, a deep reddish-brown pleochroic biotite, apatite, and iron ore.

A very few grains of plagioclase were also observed. Micropegmatitic structure is beautifully shown in portions of the section. The rock is tolerably fresh, but the orthorhombic pyroxene (hypersthene) shows the characteristic alteration, the grains being traversed by a network of cracks filled with serpentinous material.

A determination made in the Laboratory of the Survey, gave 62·68 as the percentage of silica present in the rock. This would place it with the syenites rather than with the granites, and it might perhaps be termed a hypersthene syenite containing a little quartz. It bears a close resemblance to some of the rocks from Château Richer, Quebec, described by me as pyroxene granite gneisses but which have not yet been analysed.

7. Gabbro, approaching diabase in structure.—End of Survey, Ashuanipi Branch, Hamilton River.

A very dark coloured, medium-grained, massive-looking rock,* having for its principal mineral constituents plagioclase felspar, stained brown by decomposition products; monoclinic and orthorhombic pyroxenes, the former being the more abundant; some deep reddish-brown strongly pleochroic biotite; ilmenite accompanied in some cases by leucoxene; a small quantity of apatite.

The structure, whilst in the main that of a gabbro, in some portions is ophitic, approaching in that respect to a diabase.

8. Gabbro Gneiss ?.—Ossokmannau Lake, Attikonak Branch, Hamilton River.

A medium-grained, dark green and brown, rusty, gneissic rock, which, under the microscope, is seen to be greatly granulated, affording an excellent example of Törnebohm's "mortar-structure." Both striated and non-striated felspars are present, the latter in considerable quantity, so that a separation would be necessary to determine its true character. But I am inclined to believe that much of this non-striated material is plagioclase, as pressure-twinning has been developed in portions of some of the grains. Quartz is present, but not abundant, and both monoclinic and orthorhombic pyroxenes occur. The monoclinic form is pale-green in colour and feebly pleochroic, whilst the orthorhombic (hypersthene) is strongly pleochroic in red and green tints. Hornblende and biotite occur in small irregular individuals, and ilmenite with leucoxene is very abundant. The rock has a granitoid structure, and exhibits abundant evidence of intense dynamic action in the cracking and granulation of its constituent minerals,

*Ann. Rep., Geol. Surv. Can., vol. V., 1890-91, part L., appendix, pp. 81, 82.

and their very uneven extinctions. It is stained a yellowish-brown colour throughout, due to hydrous oxides of iron.

9. GREYWACKE.—Outlet of Cambrian Lake, Koksoak River.

An exceedingly fine and even-grained, massive, dark green, rusty-weathering rock, the clastic origin of which is at once revealed by the microscope. It consists of angular and sub-angular fragments of quartz and felspar with granules of iron ore and epidote, in a matrix, not at all abundant, of sericitic and chloritic material. Both striated and non-striated felspar are present, and the rock is a typical greywacke.

10. DIORITE ?—Ten miles above Broken Paddle River, East Main River.

This is a medium-grained massive rock, of a very dark green colour, mottled with yellowish-brown, and showing an indistinct foliation. The microscope shows it to consist of a clear mosaic of interlocking grains, evidently re-crystallized, and containing both felspar and quartz, although it is now impossible to distinguish between the two minerals without obtaining axial figures.

Through this mosaic are scattered irregular patches of a green, strongly pleochroic, compact hornblende, which has a secondary appearance, and is frequently arranged in rudely radiating groups of individuals. It is intimately associated with patches of granular, and apparently secondary, iron ore. The section suggests a basic eruptive rock, which has been changed to its present conditions by contact or dynamic metamorphism.

11. DIORITE, EXTREMELY ALTERED.—Muskrat Falls, Hamilton River.

A medium-grained, somewhat foliated, dark yellowish-green, rusty weathering rock, the hand specimen of which is studded with small cubes of pyrite. Under the microscope it is seen to be in a highly altered and crushed condition, consisting now chiefly of much decomposed and granulated plagioclase felspar, small masses of fibrous chloritized hornblende evidently secondary in origin, and patches of a peculiar deep brown granular titanite, which, from the fact that they hold occasional cores of ilmenite, have probably been derived from the alteration of that mineral.

The whole section is filled with the products of decomposition, such as epidote, chlorite, and sericite, and is plentifully sprinkled with pyrite. The rock is evidently a much altered diorite, perhaps derived from a gabbro.

12. Uralitic Gabbro.—Lookout Mountain, near Grand Falls, Hamilton River.

A medium-grained, mottled green and yellowish-white, massive-looking rock.

The thin section shows it to be greatly altered, with a gabbro-like structure, and consisting principally of plagioclase felspar (some non-striated grains also occur); hornblende of a pale green colour and uralitic appearance, having the borders of the grains of a darker colour than the centres; a deep brown strongly pleochroic biotite intimately associated with the hornblende, and ilmenite with leucoxene.

The felspar is full of prismatic crystals of epidote and scales of sericite. Chlorite is very abundant in the section. The rock is evidently an altered gabbro.

13. Pyroxenite (Hypersthenite).—Five miles above the Minipi Branch, Hamilton River.

The hand specimen shows a coarse-grained mixture of broad tabular crystals of hypersthene and plates of biotite, the rock being of a brownish-green colour, and these two minerals apparently its sole constituents.

About the only minerals observed in the thin section were a strongly pleochroic orthorhombic pyroxene (hypersthene) and a deep brown biotite. A very few minute areas of a clear, colourless mineral, apparently quartz, lie between some of the pyroxene grains.

The orthorhombic pyroxene is quite fresh, and, as stated, strongly pleochroic, with $\mathfrak{a}$ = red, $\mathfrak{b}$ = yellowish-green, $\mathfrak{c}$ = green.

Examined in convergent light it gave the optical characters of hypersthene. It is remarkably free from the dark scales and rods usually present in that mineral, a fact already noted by Dr. Adams in the case of the Norian rocks of Canada.* The rock is evidently a member of the pyroxenite group and may be termed a hypersthenite.

14. Diabase?, extremely altered.—First Portage from Obatagoman Lake to Chibougamoo Lake.

A pale green, fine-grained, rusty-weathering, massive-looking rock, with indistinct traces of foliation. This is an extremely altered basic eruptive, probably a diabase, as traces of ophitic structure can still be detected in the section, which is traversed by little cracks filled with quartz, and exhibits such a stage of decomposition as to render a minute description of no special interest. The bisilicate, augite, origi-

* Ueber das Norian oder Ober-Laurentian von Canada. F. D. Adams. Stuttgart, 1893.

nally present, has been changed to a fibrous hornblende, and this again is largely altered to chlorite. The plagioclase felspar is almost completely saussuritized.

15. Porphyritic Diabase.—On the portage route between Obatagoman and Chibougamoo lakes.

A dark green, fine-grained, massive, porphyritic rock, with distinct ophitic structure in the groundmass and having numerous large phenocrysts of plagioclase scattered through it.

The rock is much altered, but the ordinary structure of a diabase is seen in the thin section. The numerous porphyritically-developed plagioclases are much saussuritized. The section is thickly sprinkled with small granules of iron ore and presents no unusual features.

16. Amphibolite (sheared basic eruptive).—Ten miles above Broken Paddle River, East Main River.

A medium-grained, pale greenish, well-foliated schistose rock, with slickensided surfaces evidently due to shearing. The thin section shows that the rock has been subjected to intense dynamic action, consisting now of a very finely granulated mosaic of quartz and felspar in which a few larger fragments of these minerals are embedded, together with bunches of a fibrous hornblende, now largely altered to chlorite, and patches of a peculiar deep brown granular titanite evidently resulting from the decomposition of ilmenite and still holding an occasional small core of that mineral.

The rock has evidently resulted from the shearing and crushing of some basic eruptive, perhaps a gabbro.

17. Amphibolite (sheared basic eruptive).—Ten miles above Broken Paddle River, East Main River.

A dark green, medium-grained, distinctly banded rock, having a much more massive appearance than No. 16, to which, as regards origin, it is closely allied; but re-crystallization has proceeded farther in this case and it is consequently in a much fresher condition. Its foliated character is well seen in the section. The quartz and felspar form a clear interlocking mosaic, and the hornblende is of the "compact" variety so characteristic of rocks of this class and is intergrown with the quartz and felspar. A brown pleochroic biotite, apparently secondary in origin, is abundant in small scales distributed through the quartz-felspar mosaic. Small granules of iron ore are also plentiful.

The rock as seen in the section is apparently the final stage of alteration of some basic eruptive and greatly resembles that described by Teall in the case of the Scourie Dyke in Scotland.*

18. Uralitic Diabase.—Two miles below Ross Gorge, East Main River.

In the hand specimen this is a dark greenish-gray, fine-grained, massive rock, with distinct ophitic structure and containing much pyrite.

The section reveals the fact that both plagioclase and augite are extremely altered, but the structure of the rock is undoubtedly that of a diabase. Granules of iron ore and epidote are plentifully scattered through it in addition to the pyrite.

The augite has altered to a fibrous hornblende which, in its turn, has become largely chloritized.

19. Hornblende Granite Gneiss.—Three miles above Grand Falls, Hamilton River.

A rather coarse-grained, well-foliated, greenish and yellowish "augen"-gneiss.

A marked cataclastic and foliated structure is exhibited in the thin section. Larger fragments of quartz and felspar are embedded in a finer-grained mosaic of the same materials, through which run strings of hornblende and biotite with large crystals of a clove-brown, strongly pleochroic titanite.

Both orthoclase and plagioclase occur, the former predominating, and occasionally showing the structure of microcline due to pressure.

The rock has apparently been partially re-crystallized and is filled with needles and irregular grains of epidote. The larger fragments of quartz and felspar are remarkably full of inclusions of this and other minerals. The titanite crystals are remarkable for their size and deep brown colour.

I regard the rock as being a hornblende granite squeezed into a gneiss.

20. Diabase, extremely altered.—Lake Petitsikapau, Ashuanipi Branch, Hamilton River.

A fine-grained, dark green, massive rock, full of pyrite. The thin section shows two portions of the rock, an outer and more altered portion, and an inner one, which, whilst still much altered, is not quite so much so as the outer or surface portion.

* Teall. On the Metamorphosis of Dolerite into Hornblende Schist. Q. J. G. S., vol. XLI, 1885, p. 133; also British Petrography. pp. 154, 198-200, and plate XXI.

The mass is evidently diabasic in character, the ophitic structure being still visible. The pyroxene now exists as small cores in masses of brown serpentinous decomposition products lying between the lath-shaped sections of plagioclase. The lighter and more highly altered portion of the section contains more light green chlorite than the darker.

Irregular patches of leucoxene with occasional cores of ilmenite, and pyrite, are plentiful. An orthorhombic pyroxene is also apparently present in small quantity. Epidote is abundant, often in radiating bundles of needle-like crystals.

21. CRUSHED GRANITE (OR SYENITE ?).—Foot of Great Bend, East Main River.

A mottled, greenish-gray and white, medium-grained, granitic-looking rock, which has been greatly crushed and now consists of a mosaic of felspar and quartz lying between larger grains of these minerals ("mortar-structure"), with scales of biotite plentifully distributed throughout the mass. Epidote is exceedingly abundant, and occasionally encloses sharply defined pleochroic allanite crystals. Much of it has evidently resulted from the saussuritization of the felspar and is accompanied by sericite.

Both orthoclase and plagioclase are present, but the former greatly predominates. Some titanites and apatites also occur.

In the particular section examined, quartz is comparatively scarce, and suggests that a further study and analysis of the rock might lead to its being placed with the syenites rather than with the granites.

22. DIABASE, MUCH ALTERED.—Outlet of Dyke Lake, Ashuanipi Branch, Hamilton River.

An exceedingly fine-grained, dark green, rusty-weathering, compact, massive rock, with occasional felspar crystals embedded in it. It is now extremely decomposed and filled with calcite, epidote, chlorite, hydrous oxides of iron, and other alteration products, but traces of its original ophitic structure may still be seen. Magnetite in small granules and crystals is abundant. The rock is undoubtedly a highly altered diabase.

23. DIORITE ?—Five miles below Stillwater Branch, Koksoak River.

A medium-grained, greenish-gray, rusty weathering rock, which the thin section shows to be made up of a bleached chloritic hornblende associated with much saussuritized plagioclase felspar.

Leucoxene, resulting from the alteration of ilmenite, is abundant, and pyrite is also sprinkled through the mass. The hornblende conveys the impression of being primary in its origin and occasionally shows a twinned structure. The rock is probably a decomposed diorite.

24. Anorthosite.—First lake on portage route from Romaine River to St. John River.

A pale grayish, almost white, medium-grained, crystalline granular rock, looking very much like a crystalline limestone.

Only a few streaks and spots of coloured bisilicates occur in the specimen, which is mainly composed of plagioclase felspar.

This is a typical representative of that division of the gabbro family in which the coloured constituents constitute only a very insignificant portion of the mass of the rock. The section is almost entirely composed of clear, colourless, well-striated labradorite with an extinction angle on $\infty P \breve{\infty}$ of about 25°. It is in general quite fresh, but traces of alteration to sericite, calcite, epidote, zoisite, etc., were here and there observed. A very few irregular grains of a fresh green hornblende, with the characteristic cleavages and pleochroism of that mineral, are present, usually associated with an opaque iron ore, which also occurs in smaller granules dotted through the felspar.

Mica and hypersthene are also present in other portions of the rock.

25. Mica Diorite Gneiss (crushed and altered eruptive ?)—One mile above Broken Paddle River, East Main River.

In the hand specimen this is a dark greenish-gray, distinctly foliated and rusty-weathering rock, having numerous fragments and crystals of quartz, felspar, and hornblende scattered through the finer-grained groundmass, also numerous cubes of pyrite.

It has evidently been greatly crushed and squeezed and now consists chiefly of a fine-grained quartz-felspar mosaic containing larger fragments of these minerals, much biotite, and some hornblende largely altered to chlorite. Pyrite, titanite, epidote, ilmenite with leucoxene, and a large quantity of calcite are also present. Owing to the extremely granulated condition of the material it is difficult to make out the nature of the felspar, but plagioclase appears to predominate (it certainly does in the larger fragments) and the rock is probably the result of the crushing of a diorite or gabbro.

26. Diorite (altered gabbro ?)—Near mouth of Akuatago River, East Main River.

A dark greenish-gray, medium-grained, indistinctly foliated rock.

The section bears evidence that it has been greatly crushed and granulated. Plagioclase felspar, hornblende, some quartz, biotite and iron ore are the principal minerals present. Pyrite, apatite, chlorite, and epidote also occur.

Much of the hornblende has a frayed-out, actinolitic appearance, and occasionally surrounds more compact cores of a deeper green colour, largely altered to chlorite, which resemble augites.

The biotite is largely secondary and is intimately intergrown with the hornblende.

The rock may be an extremely altered gabbro.

27. URALITIC GABBRO, WITH AN APPROACH TO DIABASIC STRUCTURE. —Eight miles above Broken Paddle River, East Main River.

A dark green mottled with white, compact, rusty-weathering rock. It is much altered and now consists chiefly of plagioclase felspar and a pale green uralitic hornblende, the individuals of which have borders of a deeper colour than the centres.

The section is filled with granules of epidote, chlorite, and other decomposition products. Some titanite is also present. An approach to diabasic structure may be seen in portions of the rock, which, in the main, may be regarded as a crushed and altered gabbro.

28. EXTREMELY CRUSHED PORPHYRITIC ROCK ?—Three miles above Broken Paddle River, East Main River.

A dark green, somewhat porphyritic, indistinctly foliated rock. The section exhibits such an extreme stage of granulation as to render a determination of the true character of the rock a matter of great difficulty.

Fragments of plagioclase, orthoclase, quartz, and granules of iron ore with numerous scales of an apparently secondary biotite, are scattered through a very fine-grained quartz-felspar mosaic. Pyrite is rather abundant.

29. DIORITE.—Prosper Gorge, East Main River.

A medium-grained, dark green, rusty-weathering, compact, massive rock. Plagioclase felspar and a pale green uralitic hornblende are its chief constituents, together with some biotite and iron ore.

The plagioclase is quite fresh, and portions of the section have a decided diabasic structure.

The whole of the hornblende may have resulted from the alteration of the augite of a diabase, as, although no cores of the latter minera were detected, the hornblende has a secondary appearance.

30. Altered Diabase.—One mile below Akuatago River, East Main River.

A dark green, chloritic-looking rock, which in the thin section exhibits a coarse ophitic structure, the spaces between the plagioclase crystals being filled with a mass of scales of rather pale brown biotite, evidently of secondary origin. The plagioclase is very turbid. No iron ore was seen in the section.

31. Altered Diabase.—Three miles and a half above Broken Paddle River, East Main River.

A medium-grained, dark green, rusty-weathering, compact rock, in which the plagioclase felspar is almost completely saussuritized, retaining only traces of its original striation.

The augite is largely altered to pale green hornblende, chlorite and a serpentinous substance. Epidote, and ilmenite accompanied by leucoxene are abundant. A little quartz was seen.

The section shows the typical ophitic structure of a diabase.

[The three following descriptions of rocks from Labrador have been condensed from a paper by Mr. A. E. Barlow* of this Survey :]

32. Gabbro, with an approach to diabasic structure.—Ten miles north of Lake Kawachagami, on the portage route between the Rupert and East Main Rivers.

In the hand specimen this is a dark greenish gabbro-like rock, with yellowish-green plagioclase phenocrysts. It consists chiefly of plagioclase, augite and ilmenite.

The larger phenocrysts of plagioclase show marked alteration, and are precisely similar to those described by Thompson as "Huronite." Their specific gravity is 2·725.

The augite is largely altered to hornblende, but cores of the former mineral still remain. Ilmenite, occasionally altered to leucoxene, is rather abundant. Epidote is present as a decomposition product, and apatite is very plentiful. Considerable areas of granophyre were observed in the section, portions of which also show a coarse ophitic structure.

33. Olivine Diabase.—Fault Hill, Dyke Lake, Ashuanipi Branch, Hamilton River.

In the hand specimen this is a medium-grained, dark green almost black rock, with occasional small imperfect phenocrysts of saussuritized

*On some Dykes containing Huronite, by A. E. Barlow, M.A., Ottawa Naturalist, vol. IX., No. 2, 1895.

plagioclase. Under the microscope it is seen to be composed chiefly of plagioclase, considerably altered to saussurite, especially in the case of larger individuals; fresh brownish-red, pleochroic augite, mostly allotriomorphic in form, but occasionally with sharp crystal outlines; serpentine, which has evidently resulted from the alteration of olivine; and ilmenite in large irregular fragments and small granules, in both cases showing alteration to leucoxene.

34. Diabase.—Near entrance to Dyke Lake, Ashuanipi Branch, Hamilton River.

A dark greenish-gray, rather coarse-grained rock, in which are embedded numerous phenocrysts of altered, greenish felspar (Huronite), some of which in the main mass of the rock are three-fourths of an inch in diameter.

They are extremely abundant, and, together with the plagioclases of the groundmass, are largely altered to sericite and epidote. Their specific gravity is 2·773.

The augite, when fresh, which is rarely the case, is reddish in colour and distinctly pleochroic. Ilmenite, altered to leucoxene, is abundant, as are also chlorite, apatite and pyrite.

APPENDIX VI.

List of the Plants known to occur on the Coast and in the Interior of the Labrador Peninsula. Compiled by James M. Macoun.

The following list, which has been carefully compiled from lists already published and from MS. notes and specimens in the herbarium of the Geological Survey, is divided into four columns, so that the distribution of each species, so far as known, may be seen at a glance.

The first column contains those species known to occur on the coast of Labrador, the second those growing in the basin of the upper Hamilton River, the third those growing in the basins of the Rupert and East Main rivers and the fourth those growing along the shores of James Bay. The area included in the second and third columns comprises the whole central part of the peninsula, and many of the plants noted in the third column and not in the second doubtless grow in the basin of the Hamilton River; but, while the third column represents the collections made in three seasons, under favourable conditions and over a wide area, one season only was spent on the Hamilton River.

The first column has been copied from Dr. Packard's "The Labrador Coast," with the addition of a few species overlooked when his list was compiled, or which have since been collected. The species included in the other three columns have all been collected by Mr. Low or his assistants, Mr. J. M. Macoun having made the collections in 1885 and 1887, and Mr. A. H. D. Ross, in 1892, the very complete collection of the plants growing along the East Main River. Lists of the plants found at Lake Mistassini, on the Rupert River and along the shores of James Bay have been printed as addenda to Mr. Low's reports of 1885 and 1887, and to these the results of his explorations in 1888, 1892, 1893 and 1894 are now added.

Recent revisions of genera have in some cases changed the names that appear in this list, but to obviate the printing of synonyms the names under which species and varieties have been already recorded from the Labrador Peninsula have been retained, except where a correction was necessary or there was the possibility of confusing two plants: in such cases both names are given.

——	1.	2.	3.	4.
RANUNCULACEÆ.				
Anemone parviflora, Michx	*	*	*	*
" multifida, DC	....	....	*	*
" dichotoma, Linn	....	....	*	*
Thalictrum dioicum, Linn	*	*	*	....
" polygamum, Muhl. (*T. Cornuti*, Linn.)	*	....	....	....
Ranunculus aquatilis, Linn., var. trichophyllus, Chaix	....	*	*	....
" Cymbalaria, Pursh	....	....	*	*
" rep ans. Linn	*	*	*	....
" affinis, R. Br	*	....	....	....
" " var. validus, Gray	....	....	....	*
" abortivus, Linn	....	*	*	*
" recurvatus, Poir	....	....	*	....
" pygmæus, Wahl	*	....	....	....
" nivalis, Linn	*	....	....	....
" ac is, Linn	....	....	*	*
" Pennsylvanicus, Linn	....	....	*	....
Caltha palustris, Linn	*	.	*	*
Coptis trifolia, Salisb	*	*	*	*
Actæa spicata, L., var. rubra, Ait	....	*	*	....
" alba, Big	....	....	....	*
NYMPHÆACEÆ.				
Nuphar advena, Ait	*	*	*	....
SARRACENIACEÆ.				
Sarracenia purpurea, Linn	*	....	*	....
PAPAVERACEÆ.				
Papaver nudicaule, Linn	*	....	....	....
FUMARIACEÆ.				
Corydalis glauca, Pursh	....	*	*	....
CRUCIFERÆ.				
Nasturtium palustre, DC	....	....	*	*
Cardamine hirsuta, Linn	....	*	*	*
" pratensis, Linn	*	....	*	*
Arabis stricta, Huds. (*A. confinis*, Wat.)	*	....	....	....
" alpina, Linn	*	*	....	....
" humifusa, Wat., var. pubescens, Wat	....	....	....	*
Barbarea vulgaris, R. Br	....	*	....	....
Erysimum cheiranthoides, Linn	....	....	....	*
Sisymbium humile, C. A. Meyer	....	....	....	*
Draba alpina, Linn., var. (?) corymbosa, Dur	*	....	....	....
" stellata, Jacq., var. nivalis, Regel	*	....	....	....
" incana, Linn	*	....	....	....
" " var. confusa, Poir	*	....	....	*
" arabisans, Michx	*	....	....	....
" aurea, Vahl	*	....	....	*
Cochlearia officinalis, Linn	*	....	....	....
" tridactylites, Banks	*	....	....	....
Capsella Bursa-pastoris, Mœnch	*	....	*	*
Thlaspi arvense, Linn	....	....	....	*
Viola blanda, Willd	*	*	*	*
" palmata, Linn., var. cucullata, Gray	....	....	*	....
" palustris, Linn.	....	*	....	....
" canina, Linn., var. Muhlenbergii, Gray	*	*	*	*

——	1.	2.	3.	4.
CARYOPHYLLACEÆ.				
Silene Armeria, Linn				*
" noctiflora, Linn				*
" acaulis, Linn	*			*
Lychnis apetala, Linn	*			
" alpina, Linn	*			
Arenaria verna, Linn	*			
" " var. hirta, Wat			*	*
" Michauxii, Hook			*	
" Grœnlandica, Spreng	*	*		
" serpyllifolia, Linn	*			
" lateriflora, Linn		*		*
" peploides, Linn	*			*
Stellaria media, Smith				*
" borealis, Bigel	*	*		
" " var. alpestris, Gray			*	
" crassifolia, Ehrh	*			
" longipes, Goldie		*	*	
" " var. minor, Hook	*			
" " " Edwardsii, T. and G	*			*
" humifusa, Rottb	*		*	
Cerastium vulgatum, Linn				*
" arvense, Linn			*	*
" alpinum, Linn	*	*		*
Sagina nodosa, E. Meyer	*			*
Buda borealis, Wat. (*Spergularia salina*, Presl.)	*			
PORTULACACEÆ.				
Montia fontana, Linn	*			
LINACEÆ.				
Linum perenne, Linn				*
GERANIACEÆ.				
Geranium Carolinianum, Linn			*	
RHAMNACEÆ.				
Rhamnus alnifolius, L'Her			*	
SAPINDACEÆ.				
Acer spicatum, Lam			*	
LEGUMINOSEÆ.				
Trifolium repens, Linn				*
Astragalus alpinus, Linn	*			*
Oxytropis podocarpa, Gray	*			
" campestris, Linn., var. cærulea, Koch	*			
Hedysarum boreale, Nutt	*			
Vicia Cracca, Linn				*
" Americana, Muhl			*	*
Lathyrus maritimus, Bigel	*			*
" paluster, Linn	*	*	*	*
ROSACEÆ.				
Prunus Pennsylvanica, Linn	*	*	*	
Spiræa salicifolia, Linn		*	*	

—	1.	2.	3.	4.
ROSACEÆ—*Continued.*				
Rubus Chamæmorus, Linn	*	*	*	*
" arcticus, Linn	*	*	*	*
" " var. grandiflorus, Ledeb	*	*	*	*
" triflorus, Rich	*	*	*	*
" strigosus, Michx	....	*	*	*
Dryas octopetala, Linn	*	....	....	....
" " var. integrifolia, Cham. Sch	....	*	....	*
Geum macrophyllum, Willd	....	....	*	....
" strictum, Linn	....	*	*	....
" rivale, Linn	*	....	*	....
" triflorum, Pursh	*	....	....	....
Sibbaldia procumbens, Linn	*	....	....	*
Fragaria Virginiana, Ehrh	....	*	*	*
Potentilla Norvegica, Linn	*	*	*	*
" arguta, Pursh	....	....	*	....
" Pennsylvanica, Linn	....	...	*	*
" nivea, Linn	*	....	....	....
" maculata, Poir	*	....	....	*
" emarginata, Pursh	*	....	...	*
" palustris, Scop	*	*	*	*
" fruticosa, Linn	*	*	*	*
" tridentata, Sol	*	*	*	*
" anserina, Linn	*	....	*	*
Alchemilla vulgaris, Linn	*	....	....	....
Poterium Canadense, Benth and Hook	*	*	....	....
Rosa Sayi, Schwein	....	....	*	*
Pyrus Americana, DC	*	*	*	*
Amelanchier Canadensis, T. and G., var. oblongifolia, T. and G	....	*	*	....
" " " oligocarpa, T. and G	*	*	*	....
SAXIFRAGACEÆ.				
Saxifraga oppositifolia, Linn	*	....	....	....
" Aizoon, Jacq	*	....	....	....
" cæspitosa, Linn	*	....	....	....
" rivularis, Linn	*	....	....	....
" cernua, Linn	*	....	....	....
" nivalis, Linn	*	....	....	....
" hieracifolia, Waldst. and Kit	*	....	....	....
" Hirculus, Linn	....	...	...	*
" tricuspidata, Retz	*	....	....	*
" aizoides, Linn	*	....	....	*
Mitella nuda, Linn	*	*	*	*
Parnassia palustris, Linn	*	....	*	*
" parviflora, Linn	*	*	....	*
" Kotzebuei, Cham. and Schlecht	*	...	....	*
Ribes oxycanthoides, Linn	....	....	*	*
" lacustris, Poir	....	....	*	*
" rubrum, Linn	....	*	*	*
" prostratum, L'Her	*	*	*	....
CRASSULACEÆ.				
Sedum Rhodiola, DC	*	....	....	....
DROSERACEÆ.				
Drosera rotundifolia, Linn	*	....	*	....
" intermedia, Drev. and Hayne, var. Americana, DC	....	*	*	....

—	1.	2.	3.	4.
HALORAGEÆ.				
Hippuris vulgaris, Linn	*	....	*	*
Myriophyllum spicatum, Linn	....	....	....	*
ONAGRACEÆ.				
Circœa alpina, Linn	....	....	....	*
Epilobium spicatum, Lam. (*E. angustifolium*, Linn.)	*	*	*	*
" latifolium, Linn	*	*	....	*
" anagallidifolium, Lam. (*E. alpinum* of Packard's list)	*	....	....	....
" palustre, Linn	*	....	....	*
" lineare, Muhl	*	....	*	....
" adenocaulon, Hausskn. (*E. tetragonum* of Lake Mistassini list)	....	*	*	*
UMBELLIFERÆ.				
Sanicula Marilandica, Linn	..	....	*	...
Sium cicutæfolium, Gmelin	....	....	*	....
Cicuta maculata, Linn	....	....	*	*
" bulbifera, Linn	....	....	*	....
Ligusticum Scoticum, Linn	*	....	....	*
Archangelica atropurpurea, Hoffm	*	...	....	*
" Gmelini, DC	*	....	....	....
Heracleum lanatum, Michx	*	....	*	*
ARALIACEÆ.				
Aralia hispida, Michx	....	....	*	....
" nudicaulis, Linn	....	....	*	....
CORNACEÆ.				
Cornus Canadensis, Linn	*	*	*	*
" suecica, Linn	*	*	....	....
" sericea, Linn	....	....	*	*
" stolonifera, Michx	....	*	*	*
CAPRIFOLIACEÆ.				
Sambucus racemosa, Linn., var. pubens, Wat	....	....	*	....
Viburnum pauciflorum, Pylaie	*	*	*	*
Linnæa borealis, Gronov	*	*	*	*
Lonicera involcrata, Banks	....	....	*	*
" cærulea, Linn	*	*	*	....
Diervilla trifida, Mœnch	....	...	*	*
RUBIACEÆ.				
Galium asprellum, Michx	....	....	*	....
" trifidum, Linn	*	*	*	*
" triflorum, Michx	....	....	*	*
" boreale, Linn	....	....	*	*
VALERIANACEÆ.				
Valeriana sylvatica, Rich	....	....	*	....
COMPOSITÆ.				
Eupatorium purpureum, Linn	....	....	*	*
Solidago bicolor, Linn., var. concolor, Torr. and Gray	....	....	*	....

——	1.	2.	3.	4.
COMPOSITÆ—*Continued.*				
Solidago macrophylla, Pursh	*	*	*	....
" multiradiata, Ait	*	....	....	....
" Virgaurea, Linn, var. alpina, Bigel	*	....	....	....
" humilis, Pursh	*	....	....	*
" uliginosa, Nutt	....	....	*	....
" Canadensis, Linn	....	*	*	*
" nemoralis	....	....	*	*
" lanceolata, Linn	....	....	*	*
Aster radula, Ait	*	*	*	....
" " var. strictus, Gray	*	....	....	....
" lævis, Linn	....	....	*	....
" Lindleyanus, T. and G	....	....	*	....
" salicifolius, Ait	....	....	....	*
" puniceus, Linn	....	*	*	*
" paniculatus, Lam	....	....	....	*
" junceus, Ait	....	....	....	*
" nemoralis, Ait	....	....	*	....
" umbellatus, Mill	....	....	*	....
Erigeron, hyssopifolius, Michx	....	....	*	*
" uniflorus, Linn	*	....	....	*
" Philadelphicus, Linn	....	....	*	*
" acris, Linn	*	....	....	*
" " var. Drœbachensis, Blytt	....	....	....	*
" Canadensis, Linn	....	....	*	....
Antennaria plantaginifolia, Hook	....	....	*	....
" dioica, Gærtn	*	....	....	*
" alpina, Gærtn	*	....	....	....
" Carpathica, R. Br	*	....	*	*
Anaphalis margaritacea, Benth. and Hook	....	....	*	*
Gnaphalium Norvegicum, Gunner	*	....	....	....
" supinum, Vill	*	....	....	....
Bidens frondosa, Linn	....	....	....	*
" cernua, Linn	....	....	*	*
Chrysanthemum arcticum, Linn	....	....	....	*
Achillæa Millefolium, Linn	*	*	*	*
Tanacetum Huronense, Nutt	....	....	....	*
Artemisia borealis, Pall., var. spithamœa, T. and G	*	....	....	....
" " " " Wormskioldii, Bess	....	....	*	*
" Canadensis, Michx	....	....	....	*
Petasites palmata, Gray	*	*	*	*
" sagittata, Gray	....	....	*	*
Arnica alpina, Murr	*	....	....	....
Senecio vulgaris, Linn	....	....	....	*
" aureus, Linn	....	....	*	*
" " var. Balsamitæ, Torr. and Gray	....	....	....	*
" " " borealis, Torr. and Gray	*	....	....	....
" " " obovatus, Torr. and Gray	....	....	*	....
" Pseudo-Arnica, Less	*	....	....	*
" frigidus, Less	*	....	....	....
Cnicus muticus, Pursh	....	*	*	*
Hieracium vulgatum, Fries	*	....	....	....
" umbellatum, Linn	....	....	*	*
" scabrum, Michx	....	....	*	....
Taraxacum officinale, Weber	....	....	....	*
" " " var. alpinum, Koch	*	....	....	*
" " " " lividum, Koch	....	*	*	....
Lactuca lencophæa, Gray	....	....	*	....
" pulchella, DC	....	....	....	*
Prenanthes alba, Linn	....	....	*	....
" racemosa, Hook	....	....	*	*

——	1.	2.	3.	4.
LOBELIACEÆ.				
Lobelia Dortmanna, Linn			*	
" Kalmii, Linn			*	*
CAMPANULACEÆ.				
Campanula rotundifolia, Linn		*	*	*
" " var. artica, Lange	*			*
" uniflora, Linn	*			
VACCINIACEÆ.				
Vaccinium Pennsylvanicum, Lam			*	
" " var. angustifolium, Gray	*	*		
" Canadense, Kalm		*	*	
" uliginosum, Linn	*	*	*	*
" caespitosum, Michx	*	*		
" Vitis-Idæa, Linn	*	*	*	*
" Oxycoccus, Linn. (*Oxycoccus vulgaris*, Pursh.)	*	*	*	*
" macrocarpon, Ait. (*Oxycoccus macrocarpus*, Pursh.)	*		*	*
Chiogenes hispidula, Torr. and Gray	*	*	*	*
ERICACEÆ.				
Arctostaphylos alpina, Spreng	*	*		*
" Uva-ursi, Spreng		*	*	
Cassandra calyculata, Don	*	*	*	
Cassiope hypnoides, Don	*			
" tetargona, Don	*			
Epigæa repens, Linn		*	*	
Andromeda polifolia, Linn	*	*	*	*
Loiseleuria procumbens, Desv	*	*		
Bryanthus taxifolius, Gray	*			
Kalmia angustifolia, Linn	*	*	*	*
" glauca, Ait	*	*	*	*
Ledum palustre, Linn	*			
" latifolium, Ait	*	*	*	
Rhododendron Rhodora, Don	*			
" Lapponicum, Wahl	*			
Pyrola minor, Linn	*		*	
" secunda, Linn		*	*	*
" " var. pumila, Gray	*			
" chlorantha, Swartz	*			
" rotundifolia, Linn			*	*
" " " var. uliginosa, Gray		*	*	
" " " " pumila, Hook	*			*
Moneses uniflora, Gray	*	*	*	*
DIAPENSACEÆ.				
Diapensia Lapponica, Linn	*	*		
PLUMBAGINACEÆ.				
Armeria vulgaris, Willd	*			*
PRIMULACEÆ.				
Primula farinosa, Linn	*			
" Mistassinica, Michx	*	*	*	*
Egaliksensis, Hornem	*			*
Trientalis Americana, Pursh	*	*	*	
Lysimachia stricta, Ait			*	

——	1.	2.	3.	4.
APOCYNACEÆ.				
Apocynum androsæmifolium, Linn			*	
GENTIANACEÆ.				
Gentiana serrata, Gunner			*	*
" Amarella. Linn., var. acuta, Hook	*	*	*	*
" propinqua, Rich	*			
" nivalis, Linn	*			
" linearis, Frœl		*	*	
Pleurogyne rotata, Griseb	*			*
" Carinthiaca, Griseb., var. pusilla, Gray	*			
Halenia deflexa, Griseb	*			
Menyanthes trifoliata, Linn	*	*	*	*
BORRAGINACEÆ.				
Myosotis verna, Nutt			*	
Mertensia maritima, Don	*			*
" paniculata, Don				*
SCROPHULARIACEÆ.				
Mimulus ringens, Linn			*	
Veronica alpina, Linn	*	*		
" scutellata, Linn			*	
" Americana, Schwein			*	
" peregrina, Linn			*	
Castilleia pallida, Kunth			*	*
" " var. septentrionalis, Gray	*			*
Euphrasia officinalis, Linn	*	*	*	*
" " var. Tartarica, Benth	*			
Bartsia alpina, Linn	*	*		*
Pedicularis Grœnlandica, Retz	*			*
" Lapponica, Linn	*			*
" euphrasioides, Stephan	*			
" palustris. Linn., var. Wlassoviana, Bunge			*	*
" hirsuta, Linn	*			*
" flammea, Linn	*			*
Rhinanthus Crista-galli, Linn	*	*	*	*
Melampyrum Americanum, Michx			*	*
LENTIBULARIACEÆ.				
Utricularia vulgaris, Linn., var. Americana, Gray			*	
" intermedia, Hayne			*	
Pinguicula, vulgaris, Linn	*	*	*	*
" villosa, Linn	*			
" alpina, Linn	*			
LABIATÆ.				
Mentha Canadensis, Linn		*	*	*
" " " var. glabrata, Benth			*	*
Lycopus sinuatus, Ell			*	*
Dracocephalum parviflorum, Nutt			*	
Brunella vulgaris, Linn		*	*	
Scutellaria galericulata, Linn			*	*
" lateriflora, Linn			*	*
Lamium amplexicaule, Linn				*
Galeopsis Tetrahit, Linn				*
Stachys palustris, Linn			*	*

	1.	2.	3.	4.
PLANTAGINACEÆ.				
Plantago major, Linn..	....	*	*	*
" eriopoda, Torr.	....	....	....	*
" maritima, Linn.	*	....	....	*
CHENOPODIACEÆ.				
Chenopodium album, Linn.	....	*	*	*
POLYGONACEÆ.				
Polygonum aviculare, Linn	*	*	*	....
" " " var. borealis, Lange. (new to Canada)	....	....	*	*
" amphibium, Linn	....	....	*	....
" cilonode, Michx	....	....	*	*
" Convolvulus, Linn "	....	....	....	*
" viviparum, Linn.	*	....	*	*
" lapathifolium, Ait., var., incanum, Hook	....	....	*	....
Oxyria digyna, Camp.	*	....	....	..
Rumex verticillatus, Linn	....	....	....	*
" occidentalis, Wat	*	....	....	*
" maritimus, Linn	....	....	....	*
Kœnigia Islandica, Linn.	*	....	....	....
ELÆAGNACEÆ.				
Elæagnus argentea, Pursh..	....	....	...	*
Spehherdia Canadensis, Nutt	....	....	....	*
SANTALACEÆ.				
Comandra livida, Rich.	*	*	*	*
URTICACEÆ.				
Urtica gracilis, Ait	....	....	*	*
MYRICACEÆ.				
Myrica Gale, Linn.	....	*	*	*
BETULACEÆ.				
Betula lutea, Michx	....	....	*	....
" papyrifera, Michx	*	*	*	*
" pumila, Linn.	*	*	*	*
" glandulosa, Michx.	*	....	*	....
" nana, Linn.	*	*	....	....
Alnus incana, Willd.	....	*	*	....
" viridis, DC.	*	*	*	*
SALICACEÆ.				
Salix adenophylla, Hook	*	....	....	....
" arctica, R. Br..	*	*	.. .	*
" argyrocarpa, Anders..	*	....	....	....
" balsamifera, Barratt	*	....	....	....
" candida, Willd.	*	....	*	*
" chlorophylla, Anders	*	.. ..	..	....
" cordata, Muhl.	....	....	*	*
" desertorum, Rich	....	....	*	*
" discolor, Muhl.	....	....	*	*

——	1.	2.	3.	4.
SALICACEÆ.				
Salix glauca, Linn	*	....	*	....
" herbacea, Linn	*	....	....	....
" lucida, Muhl	....	....	*	*
" myrtilloides, Linn	....	....	*	....
" Richardsoni, Hook., var. Macouniana, Bebb	....	....	....	*
" reticulata, Linn	*	....	....	....
" rostrata, Rich	....	....	*	*
" vestita, Pursh	*	*	....	....
" Uva-ursi, Pursh	*	*	....	....
Populus tremuloides, Michx	*	*	*	*
" balsamifera, Linn	....	*	*	*
EMPETRACEÆ.				
Empetrum nigrum, Linn	*	*	*	*
CONIFERÆ.				
Thuya occidentalis, Linn	....	....	*	....
Juniperus communis, Linn	....	*	*	*
" " " var. alpina, Linn	*	....	....	....
Taxus baccata, Linn., var. Canadensis, Gray	....	*	*	*
Pinus Banksiana, Lamb	....	*	*	*
Picea alba, Link	*	*	*	*
" nigra, Link	*	*	*	*
Abies balsamea, Marsh	....	*	*	*
Larix Americana, Michx	*	*	*	*
ORCHIDACEÆ.				
Calypso borealis, Salisb	....	....	*	....
Corallorhiza innata, R. Br	....	....	*	....
Listera cordata, R. Br	*	*	*	....
" convallarioides, Nutt	....	....	*	....
Spiranthes Romanzoviana, Cham	....	*	*	*
Goodyera repens, R. Br	....	....	*	....
Orchis rotundifolia, Gray	....	....	*	*
Habenaria hyperborea, R. Br	*	....	*	*
" obtusata, Rich	*	....	*	*
" dilatata, Gray	*	*	*	....
Cypripedium pubescens, Swartz	....	....	*	....
" acaule, Ait	....	....	*	....
IRIDACEÆ.				
Iris Hookeri, Penny	*	*	....	....
" versicolor, Linn	....	....	*	....
Sisyrinchium mucronatum, Mx	....	....	*	....
LILIACEÆ.				
Streptopus amplexifolius, DC	*	....	*	....
" roseus, Michx	*	....	*	....
Smilacina stellata, Desf	*	....	*	*
" trifolia, Desf	*	....	*	....
Mianthemum Canadense, Desf. (*M. trifolium* of Mistassini list.)	*	*	*	*
Allium schœnoprasum, Linn	....	....	*	*
Tofieldia borealis, Wahl. (*T. palustris*, Huds.)	*	....	*	*
" glutinosa, Willd	....	....	*	....
Clintonia borealis, Raf	*	....	*	....

——	1.	2.	3.	4.
JUNCACEÆ.				
Juncus filiformis, Linn.	....	....	*	*
" Balticus, Willd , var. littoralis, Engel.	....	....	*	*
" triglumis, Linn.	*	....	....	....
" effusus, Linn.	....	....	....	*
" castaneus, Smith	*	....	....	....
" tenuis, Willd.	....	....	*	*
" bufonius, Linn	....	....	....	*
" alpinus, Villars, var. insignis, Fries.	....	....	*	....
" nodosus, Linn	....	....	*	....
" Canadensis, J. Gay, var. coarctatus, Engelm.	....	....	*	....
Luzula spadicea, DC.	....	....	*	....
" " var. parviflora, Meyer.	*	....	....	....
" spicata, Desv	*	....	....	*
" comosa, Meyer	....	....	....	*
" arcuata, Meyer	*	....	....	*
TYPHACEÆ.				
Sparganium simplex, Huds.	*	....	*	....
" hyperboreum, Læst., var. Americanum, Beeby	*	....	....	*
AROIDEÆ.				
Calla palustris, Linn	....	....	*	....
LEMNACEÆ.				
Lemna minor, Linn	....	....	....	*
ALISMACEÆ.				
Sagittaria variabilis, Engelm	....	....	*	*
NAIDACEÆ.				
Triglochin palustre, Linn	*	....	*	*
" maritimum, Linn	*	....	*	....
Potamogeton heterophyllus, Schreb. (Includes two varieties of *P. gramineus* in Mistassini list.)	....	....	*	....
" pauciflorus, Pursh	....	....	*	....
" pectinatus, Linn	....	....	*	*
" marinus, Linn	....	....	*	....
" perfoliatus, Linn	....	....	*	....
" pusillus, Linn	....	....	*	....
" rutilans, Wolfgang	....	....	....	*
" rufescens, Schrad.	..	....	*	....
Naias flexilis, Rostk	....	....	*	....
Zannichellia palustris, Linn.	....	....	*	....
CYPERACEÆ.				
Eleocharis palustris, R. Br.	...	....	*	*
Scirups lacustris, Linn. (*S. validus*, Vahl.)	....	....	*	....
" sylvaticus, Linn., var. digynus, Bœck. (*S. microcarpus*, Presl.)	....	....	*	*
" cæspitosus, Linn	*	*	*	*
" atrovirens, Muhl.	....	....	*	....
Eriophorum alpinum, Linn.	....	....	*	*
" cyperinum, Linn	....	....	....	*
" vaginatum, Linn	*	....	*	....
" russeolum, Fries	*	*	*	....

——	1.	2.	3.	3.
CYPERACEÆ—*Continued.*				
Eriophorum capitatum, Host. (*E. Scheuchzeri*, Hoppe.)	*	....	....	*
" polystachyon, Linn	....	*	*	....
" " " var. angustifolium, Gray	*	....	....	....
" gracile, Koch	....	....	*	....
Carex ambusta, Boott	*	....	....	....
" adusta, Boott	....	....	*	....
" aquatilis, Wahl. (*C. angustata* of Mistassini list.)	....	*	*	*
" alpina, Swartz	....	....	....	*
" arctata, Boott., var. Faxoni, Bailey	....	....	*	....
" atrata, Linn	....	....	*	....
" aurea, Nutt	....	..	*	*
" Buxbaumii, Wahl.	....	....	*	....
" canescens, Linn	*	....	*	*
" " " var. alpicola, Wahl	..	*	*	....
" " " " vulgaris, Bailey	....	....	*	....
" capillaris, Linn	....	*	*	*
" castanea, Wahl. (*C. flexilis*, Rudge.)	....	....	*	....
" chordorhiza, Ehrh	....	....	*	....
" concinna, R. Br.	....	....	*	....
" echinata, Murr	....	....	*	....
" Gmelini, Hook	...	*	....	....
" gyocrates, Wormsk	....	....	....	*
" flava, Linn	....	....	*	....
" lagopina, Wahl.	*	....	....	....
" lanuginosa, Michx.	....	*	....	....
" lenticularis, Michx	*	....	*	....
" laxiflora, Lam.	....	....	*	....
" limosa, Linn	....	....	*	....
" maritima, Vahl	....	....	....	*
" Magellanica, Lam.	*	*	*	....
" microglochin, Wahl	....	....	....	*
" miliaris, Michx.	*	....	*	*
" Michauxiana, Bœckl	....	....	*	....
" monile, Tuck	....	....	*	*
" nardina, Fries.	....	....	....	*
" Œderi, Ehrh. (*C. flava*, L., var. *viridula*, Bail.)	....	....	*	*
" oligosperma, Michx.	*	*	*	....
" polytrichoides, Muhl	....	...	*	....
" pratensis, Dreg	*	....	....	....
" rariflora, Smith	*	....	....	*
" riparia, W. Curtis	....	....	....	*
" rotundata, Wahl	*	....	....	*
" scripoidea, Michx	....	*	....	...
" salina, Wahl	*	....	....	....
" saxatilis, Linn	..	....	....	*
" scoparia, Schk	....	....	*	....
" straminea, Willd	....	....	....	*
" stricta, Lam., var. decora, Bail	....	....	....	*
" teretiuscula, Good.	....	....	*	*
" utriculata, Boott. (*C. rostrata* of lists.)	....	*	*	*
" vaginata, Tausch	*	....	*	....
" vulgaris, Fries., var. hyperborea, Boott	*	*	....	....
GRAMINEÆ.				
Beckmannia erucæformis, Host., var. uniflorus, Scrib	....	....	*	*
Panicum dichotomum, Linn	....	....	*	....
Hierochloa alpina, Rœm. and Schultz	*	....	....	*
" borealis, Rœm. and Schultz	....	*	*	*
Alopecurus geniculatus, Linn., var. aristulatus, Munro	....	*	*	....
" alpinus, Smith	....	...	....	*

——	1.	2.	3.	4.
GRAMINEÆ—*Concluded.*				
Stipa Richardsonii, Link	....	....	*	....
Oryzopsis asperifolia, Michx	....	....	*	....
Phleum pratense, Linn	....	....	*	*
" alpinum, Linn	....	....	....	*
Agrostis scabra, Willd	....	....	*	*
Cinna pendula, Trin	....	....	*	....
Calamagrostis Canadensis, Hook	....	....	*	*
" neglecta, Kunth	....	*	*	*
" Langsdorfii, Trin	....	*	*	....
Deschampsia atropurpurea, Scheele	....	....	*	....
" " " var. minor, Varey	....	....	....	*
" cæspitosa, Beauv	....	*	*	....
" alba, Rœm. and Schultz. (*D. flexuosa* of Mistassini list.)	*	*	*	....
Trisetum subspicatum, Beauv., var. molle. Gray	*	....	....	*
Catabrosa aquatica, Beauv	....	....	*	*
Poa alpina, Linn	*	....	....	....
" cæsia, Smith	....	*	....	*
" cenisia, All	*	....	....	*
" glumaris, Trin	....	....	*	*
" pratensis, Linn	....	....	*	*
Glyceria Canadensis, Trin	....	....	*	....
" arundinacea, Kunth	....	....	....	*
" nervata, Trin	....	....	*	*
Festuca ovina, Linn	....	....	....	*
" " " var. brevifolia, Wats	*	....	....	*
Bromus ciliatus, Linn	....	....	*	*
Agropyrum tenerum, Vasey	....	....	*	....
" violaceum, Lange	....	*	....	*
Hordeum jubatum, Linn	....	....	*	*
Elymus mollis, Trin	*	....	....	*
EQUISETACEÆ.				
Equisetum arvense, Linn	*	....	*	*
" pratense, Linn	....	....	*	....
" sylvaticum, Linn	*	*	*	....
" palustre, Linn	....	....	*	....
" scirpoides, Michx	....	....	*	....
OPHIOGLOSSACEÆ.				
Botrychium Lunaria, Swartz	*	....	*	*
" Virginicum, Swartz	....	....	*	....
" ternatum, Swartz., var. lunarioides, Milde	....	....	*	*
FILICES.				
Polypodium vulgare, Linn	....	....	*	....
Pellæa gracilis, Hook	....	....	*	....
Pteris aquilina. Linn	....	....	*	....
Asplenium viride, Huds	....	....	*	....
" Felix-fœmina, Bernh	....	....	*	....
Phegopteris Dryopteris, Fée	*	....	*	....
" " " var. Robertianum, Dav. (*P. calcarea,* Fée.)	....	....	*	....
" polypodioides, Fée	....	....	*	....
Aspidium spinulosum, Swartz., var. dilatatum, Hook	....	....	*	*
Onoclea sensibilis, Linn	....	....	*	....
Cystopteris fragilis, Bernh	*	....	*	....
" montana, Bernh	....	....	*	....

——	1.	2.	3.	4.
FILICES—*Concluded.*				
Woodsia glabella, R. Br.	....	....	*	....
" Ilvensis, R. Br	....	....	*	....
Osmunda regalis, Linn.	....	....	*	....
" Claytoniana, Linn.	....	....	*	....
LYCOPODIACEÆ.				
Lycopodium Selago, Linn	*	....	*	....
" lucidulum, Michx	*	....	....	....
" annotinum, Linn	....	....	*	*
" obscurum, Linn. (*L. dendroideum*, Mx.)	....	....	*	*
" clavatum, Linn	....	....	*	*
" sabinæfolium, Hook	....	....	*	....
" complanatum, Linn	....	...	*	*

APPENDIX VII.

Meteorological Observations in the Labrador Peninsula, 1893-1894 and 1895 by D. I. V. Eaton.

The barometer used was a small aneroid, but the readings have been corrected, and are believed to be nearly exact.

The temperature is stated in degrees Fahrenheit.

The force of the wind is estimated according to a scale from 0 to 5.

The proportion of the sky covered by clouds is estimated by a scale from 0 to 10; 0 being a cloudless sky, 10 a completely clouded sky. The character of the clouds is denoted by the usual letter or combination of letters referring to Howard's classification.

The letters used in the last column have the following designations: B. blue sky; C. cloudy; R. rain; G. gloomy; F. fog; O. overcast; H. haze.

Note—The observations taken between 20th June and 13th August, 1893, were lost through the upset of a canoe. The last thermometer was broken on 18th June, 1894.

METEOROLOGICAL OBSERVATIONS in the

Place.	Date.	Thermometer.			Minimum.	Barometer.		
	1893.	7	2	9		7	2	9
		°	°	°				
Kaniapeskau Lake	Aug. 14	31	70	61	...	28·16	28·16	28·19
Upper Koksoak River	" 15	58	65	61	...	28·19	28·21	28·25
	" 16	50	70	55	...	28·21	28·35	28·48
	" 17	40	75	65	...	28·48	28·54	28·62
	" 18	50	75	65	...	28·62	28·77	28 98
Koksoak River	" 19	36	76	58	...	29·06	29·11	29·12
	" 20	50	75	62	...	29·17	29·23	29·26
	" 21	54	68	54	...	29·28	29·41	29·36
	" 22	44	72	65	...	29·39	29·15	29·22
	" 23	62	53	50	...	29·16	29·14	29·09
	" 24	60	63	55	...	...	29·30	29·40
	" 25	38	64	55	...	29·46	29·44	29·56
	" 26	64	65	56	...	29·69	29·74	29·68
Fort Chimo	" 27	55	70	64	...	29·46	29·41	29·50
"	" 28	62	70	58	...	29·52	29·56	29·64
"	" 29	46	52	50	...	29·76	29·84	29·94
"	" 30	48	42	40	...	29·89	29·92	29·92
"	" 31	46	...	44	...	29·86	...	29·84
"	Sept. 1	46	66	55	...	29·76	29·66	29·56
"	" 2	49	72	56	...	29·54	29·42	29·42
"	" 3	54	50	40	...	29·46	29·46	29·50
"	" 4	40	61	47	32	29·53	...	29·44
"	" 5	50	59	50	42	29·40	29·39	29·45
"	" 6	46	48	48	...	29·65	29·72	29·76
"	" 7	45	54	40	40	29·84	29·82	29·76
"	" 8	42	56	38	33	29·79	29·83	29·86
"	" 9	36	45	38	...	29·89	29·90	29·91
Ungava Bay	" 10	35	54	...	...	29·92	29·96	29·94
George River Post	" 11	42	44	42	...	30·00	30 04	30·04
"	" 12	54	58	55	...	29·64	29·64	29·41
"	" 13	55	...	54	...	29·41	...	29·54
Ungava Bay	" 14	65	...	48	...	29·42	...	29·40
"	" 15	48	...	43	...	29·18	...	30·02
"	" 16	36	...	43	...	29·87	...	29·80
Fort Chimo	" 17	63	...	64	...	29·72	...	29·62
"	" 18	62	...	...	...	29·62	...	...
Ungava Bay	" 19	55	...	...	...	29·60	...	...
"	" 20	43	...	50	...	29·52	29·55	29·64
Port Burwell	" 21	45	...	43	...	29·64	...	29·81
	" 22	45	...	40	...	29·70	...	29·61
	" 23	40	...	42	...	29·25	...	29·25
Nachvak Bay	" 24	42	...	40	...	29·52	...	29·40
	" 25	46	...	40	...	29·15	...	29·20
	" 26	43	...	40	...	29·29	...	29·30
Davis Inlet	" 27	45	...	38	...	29·64	...	29·90

Labrador Peninsula, 1893–1894.

Wind.						Clouds.			Notes on weather during last 24 hours.
Direction.			Force.						
7	2	9	7	2	9	7	2	9	
N.E.	E.	N.E.	2	3	2	3 K.	2 K.	3 K. + C.	Clear, passing clouds.
	N.			2		4 K. S.	6 K. S.	9 K. S.	Overcast towards night.
	S.W.			1		6 K.	5 K. S.	2 K.	C. B.
		S.E.			2	3 K. S.	3 K.	4 K.	C. B., mist.
S.E.	N.E.		2	2		3 C.	3 K.	2 K.	B. C.
						3 K.	2 K.	3 K. S.	B. C.
							3 K.	3 K. S.	B. B.
S.E.	N.W.		2	3		5 C. + K. S.	10 K. S.	1 K.	B., overcast.
	S.W.			2		3 K.	8 K. + C.	9 K. + C.	C., dull.
S.			2			9 C.	N.	N.	Heavy showers, dull and gloomy.
S.	N.		1	2		N.	10 K. S.	8 K. S.	Rain, overcast and dull.
	N.	N.		3	2	2 K.	8 K. S.	8 K.	C. B.
	S.			2		8 K.	6 K. S.	7 K. S.	O. dull.
E.	S.		2	3		8 K. + C.	4 C. + 3 K.	6 K. S.	C. B.
		E.			2	5 K. S.	5 K. S.	8 K.	C. B.
E.		N.E.	2		2	6 K. S.	7 K.	8 K.	Smoky, C.
						5 K. S.	5 K. S.	1 K.	C. B.
						1 K.	1 K.	K.	Bright and clear.
		N.E.			2	1 K.	1 K.	K.	B.
		N.E.			3	K.	2 K.	2 K.	B.
	N.	N.		2	2			10 K. S.	Hazy, overcast at night.
	N.					7 K. + C.		8 K. + 1 C.	C. B.
						9 K. S.	6 K. S.	10 S.	Rain at night.
	N.W.	N.W.		2	2	8 K. S.	6 K. S.	7 K. S.	C. B.
W N W		W.	3		2	8 K.	7 K.	6 S. + C.	Dull and gloomy.
	E.	N.E.		3	2	8 K.	5 K.	9 K. S.	C. B.
N.	N.	N.	2	1	2	8 K.	7 K.	8 K. S.	Fog, dull and threatening.
N.E.	N.E.	N.E.	1	2	2	8 K. S.	5 K.	5 K. + C.	C.
N.E.	W.	W.	2	2	2	10 K.	10 K.	5 K.	Overcast and dull.
		S.E.			1	8 K. S.	6 K.	7 K. S.	C. B.
S.E.			2			7 K. S.		4 K. S.	Light showers.
		S.W.			2	6 K.		7 K.	C.
S.		S.E.	2		2	10 K.		10 K. S.	C. and fog.
						8 K. S.		4 K.	Rain.
S.E.			3			4 K.		7 K.	Dull.
S.E.	S.E.	S.E.	2			10 K.			Mist.
S.E.						10 K.		6 K. S.	O. dull.
S.E.			3			10 K.		8 K. S.	O., mist.
S.E.		W.	2		2	8 K. S.		6 K.	O., dull.
S.E.		E.	2		2	6 K.		7 K.	Fog.
S E.		S.E.	2		3	8 K. S.		7 K. S.	Overcast, fog.
S.E.		S.E.	2		1	2 K.		6 K. S.	B. C.
S.E.		S.E.	2		2	10 K. S.		6 K. S.	Fog, C. B.
N.		N.	3		3	10 K. S.		6 K. S.	C. B.
N.W.		N.W.	3		2	5 K.		4 K.	C. B.

METEOROLOGICAL OBSERVATIONS in the

Place.	Date.	Thermometer.			Minimum.	Barometer.		
	1893.	7	2	9		7	2	9
		°	°	°				
....	Sept. 28....	40	.. ..	42	....	30·04	30·14	30·14
....	" 29....	48	......	40	.....	30·14	......	30·15
....	" 30....	45	......	44	......	30·14	......	30·22
Rigolet........................	Oct. 1....	42	48	40	......	30·32	30·00	29·97
"	" 2....	39	49	40	...	29·91	29·80	29·70
"	" 3....	43	50	41	......	29·65	29·72	29·90
"	" 4....	46	56	41	......	29·87	29·85	29·99
"	" 5....	35	48	39	......	30·00	30·08	30·08
"	" 6....	34	52	40	.....	30·01	29·80	29·75
"	" 7....	40	60	41	.....	29·90	29·98	29·94
"	" 8....	41	44	42	......	29·75	29·62	29·60
"	" 9....	41	50	43	......	29·60	29·60	29·63
Hamilton Inlet....................	" 10....	44	.....	49	....	29·65	....	29·80
"	" 11....	44	45	42	...	29·90	30·00	30·00
"	" 12 ...	42	48	46	......	30·20	30·12	30·12
Northwest River, Labrador	" 13....	44	....	44	.....	29·92	....	30·00
"	" 14....	42	48	43	......	30·00	30·00	30·02
"	" 15....	43	54	51	.. .	29·56	29·31	29·24
"	" 16....	42	49	44	......	29·31	29·24	29·71
"	" 17....	36	42	36	......	29·90	29·84	29·90
"	" 18....	30	36	31	......	30·10	30·12	30·20
"	" 19....	32	38	32	.....	30·20	30·12	30·06
"	" 20....	32	40	39	......	29·85	29·80	29·74
"	" 21....	39	52	55	......	29·60	29·44	29·74
"	" 22....	39	40	42	.....	30·10	30·15	30·40
"	" 23....	44	46	32	......	30·70	30·10	30·40
"	" 24 ...	39	48	49	......	30·22	30·05	29·96
"	" 25....	53	53	48	......	29·66	29·70	29·90
"	" 26....	36	45	43	.....	30·00	30·10	30·20
"	" 27....	40	47	32	......	30·40	30·00	30·00
"	" 28....	43	45	41	......	29·89	29·90	29·75
"	" 29....	41	42	40	......	29·62	29·41	29·41
"	" 30....	42	44	34	....	29·72	30·00	30·23
"	" 31....	26	27	24	....	30·32	30·40	30·23
"	Nov. 1....	24	27	22	....	30·20	30·10	30·08
"	" 2....	28	37	38	......	30·00	29·99	29·99
"	" 3....	39	43	45	.....	29·92	29 71	29·68
"	" 4....	35	36	23	......	29·77	29·84	30·00
"	" 5....	31	36	28	......	30·00	30·04	30·05
"	" 6....	30	23	33	... .	30·00	30·00	29·99
"	" 7....	29	34	32	.....	30·16	3[illegible]·24	30·00
"	" 8....	31	35	28	......	29·80	29·60	29·60
"	" 9...	25	33	28	......	29·52	29·52	29·85
"	" 10....	15	20	14	.....	30·04	30·10	30·12
"	" 11....	18	25	14	......	30·20	30·10	30·20
"	" 12....	27	27	24	......	30·20	30·20	30·10
"	" 13....	30	36	35	......	29·95	29·92	29·94
"	" 14....	31	31	37	.....	29·96	29·92	29·89
"	" 15....	39	40	37	......	29·68	29·50	29·32
"	" 16....	41	40	28	.....	29·62	29·50	29·60
"	" 17....	25	27	22	......	29·10	29·22	29·43
"	" 18....	16	33	24	......	29·44	29·31	29·25
"	" 19....	17	19	12	......	29·44	29·50	29·70
"	" 20....	10	17	16	......	30·05	30·00	29·90

Labrador Peninsula, 1893-1894—*Continued.*

Wind.						Clouds.			Notes on weather during last 24 hours.
Direction.			Force.						
7	2	9	7	2	9	7	2	9	
N.W.	......	N.W.	2	..	4	4 K	....	6 K.S.	C. B.
N.W.	......	N.W.	2	..	1	7 K. S	....	7 K.S.	C. B.
N.W.	......	S.W.	2	..	1	....	....	5 K	B.
......	S.	S.W.	..	..	..	2 K	3 K. S	5 K	B. C.
W.	......	E.	2	..	2	7 K. C	6 K. S	8 K.S+C	C. B.
N.E.	N.	S.W.	2	2	2	9 K	4 K. S	6 K. S	C. B.
S.E.	S.	W.	2	3	2	7 K. S	2 S+c	2 K	B. C.
N.	N.E.	N.	2	2	2	3 K. S	3 K+C	5 K	B. C.
N.E.	N.	......	2	1	..	5 K	4 K. S	3 K+C	C. B.
N.E.	......	N.	2	..	2	9 K. C	5 K. S	6 K. S	B. C., aurora.
N.	N.	......	1	½	..	4 K. S	7 K	6 K	O. dull.
......	......	......	..	..	..	7 K. S	5 K. S	6 K. S	C. B.
......	......	......	..	..	..	N	....	10 K. S	Rain in morning, C.B.
......	......	......	..	..	..	6 K. S	N	7 K. S	O. D., showers.
S.	S.W.	S.W.	2	2	2	8 K. S	8 K. S	10 K. S	C. B., showers.
......	......	N.W.	..	..	2	8 S	....	8 K. S	C. B.
N.W.	N.W.	N.W.	1	2	2	8 K. S	6 K. S	S.K	C. B.
......	S.	S.W.	..	3	3	9 K. S	10 K	8 K	C. B.
S.W.	S.W.	......	3	3	..	7 K	7 K	4 K	B. C.
......	W.	......	..	1	..	7 K. S	10 K. S	10 N	C. B., rain at night.
......	......	W.	..	..	2	8 K. S	8 K	4 K. S	C. B., snow at 9 p.m.
W.	W.	W.	2	1	2	10 K. S	9 K	9 K.N.	C. B., 1 inch of snow.
S.W.	......	......	2	..	..	6 K. C	7 K	9 K	C. B., steady.
S.W.	S.W.	W.	1	1	1	5 K	7 K	....	C. B.
S.W.	......	......	2	..	..	K. S	....	....	B., bright and starry.
S.W.	S.W.	......	2	1	..	7 K	8 K	9 K. S	B.
S.	S.	S.W.	2	2	3	8 K	6 K	6 K+C	C. B., rain in early morning.
W.	S.W.	N.E.	2	1	2	8 K. S	6 K	7 K+C	B., fast moving clouds at 9 p.m.
N.	N.	N.E.	2	1	2	5 K. S	5 K. S	4 K	C. B., showers.
......	N.	N.W.	2	2	2	6 K. S	7 K. C	3 K	C. B.
W.	S.	S.E.	1	2	1	10 K	6 N	10 N	C. B.
N.E.	N.E.	W.	1	2	2	7 K	6 N	5 K+C	C. B., showers.
W.	N.E.	......	1	3	..	9 K+C	3 K+C	9 N	B. C., bright moonlight.
N.W.	N.W.	W.	1	2	1	7 K. S	6 K	6 K	C. B., snow.
W.	N.	W.	2	2	2	8 K	2 K	2 K	C. B., aurora.
N W.	N.W.	W.	2	1	1	4 C+KS	7 Ks.	5 K. S	C. B., ptarmigan seen.
S.	S.	S.	1	2	2	8 K	7 K.S+C	8 K. S	C. B.
N.W.	N.W.	......	2	2	..	8 K	1 K	....	B.
N.W.	W.	W.	1	1	1	8 K	7 K	8 K. S	C. B.
W.	......	....	½	..	..	7 K	6 K	8 K.N.	C. B., snow.
N.	N.	......	1	1	..	8 N	7 K. S	6 K. S	C. B. R.
S.W.	S.W.	S.W.	1	2	2	10 K. S	8 N	6 K	Snow, C. B.
W.	N.W.	W.	1	2	2	10 K	8 N	2 K	O. dull.
W.	N.W.	W.	1	2	2	3 K	3 K	K	B.
W.	N.W.	......	1	1	..	2 K	1 K	1 K	B.
W.	W.	......	1	1	..	2 K	2 K	1 K	B., auroıa.
N.W.	W.	W.	1	1	1	5 N	6 N	3 N	B. C., mist.
W.	N.W.	......	1	1	..	4 K. S	4 K	5 K	B. C.
S.E.	S.E.	......	1	1	..	7 K+C	4 K+C	8 K	C. B., rain, ptarmigan seen.
N.E.	S.W.	W.	1	2	2	6 K	4 N	3 K	C. B.
W.	W.	W.	3	2	2	6 K	6 K	1 K	B. C.
S.W.	N.	......	1	1	..	10 K	10 N	10 K	C. B., snow.
W.	W.	N.W.	1	1	1	3 K	2 K	....	B. B.
N.W.	N.W.	......	1	1	..	....	8 K	7 K	C. B.

METEOROLOGICAL OBSERVATIONS in the

Place.	Date.	Thermometer.			Minimum.	Barometer.		
	1893	7	2	9		7	2	9
		°	°	°				
Northwest River, Labrador..........	Nov. 21....	25	26	20	......	29·45	29·42	29·60
"	" 22....	10	25	15	.....	30·10	30·20	30·18
"	" 23....	20	26	24	.....	29·80	29·65	29·55
"	" 24....	22	25	28	......	29·62	29·62	29·42
"	" 25....	27	27	24½	.....	28·82	28·82	29·22
"	" 26....	20	21	21	......	29·62	29·62	29·80
"	" 27....	16	24	13	......	30·08	30·10	30·22
"	" 28....	2	11	12	. .	30·33	30·33	30·20
"	" 29....	30	30	33	......	29·32	29·35	29·24
"	" 30....	19	22	20	. .	29·52	29·50	29·42
"	Dec. 1....	15	22	5	......	29·42	29·40	29·75
"	" 2....	12	11	0	......	29·84	29·64	29·52
"	" 3....	10	12	-13	......	30·00	30·12	30·25
"	" 4....	- 2	5	- 1	......	30·04	29·90	29·85
"	" 5....	-18	- 4	-10	.....	30·40	30·46	30·52
"	" 6....	-14	2	2	......	30·18	30·00	29·92
"	" 7....	5	11	5	....	29·82	29·92	29·99
"	" 8....	7	3	- 8	.	30·00	30·06	30·20
"	" 9....	-15	- 6	-13	......	30·15	30·05	30·00
"	" 10....	-15	-12	-12	...	30·00	29·96	29·82
"	" 11....	- 5	3	7	......	29·55	29·45	29·35
"	" 12....	15	10	-15	......	29·72	29·80	29·82
"	" 13....	-25	-10	-25	......	29·95	29·94	29·93
"	" 14...	-25	-16	-17	......	29·84	29·82	29·86
"	" 15....	-10	- 9	- 8	......	29·82	29·83	30·02
"	" 16....	- 6	- 2	- 2	......	30·26	20·25	30·15
"	" 17....	10	26	25	......	29·30	29·32	29·45
"	" 18....	21	18	8	......	29·52	29·45	29·42
"	" 19....	0	0	12	......	29·82	30·00	30·00
"	" 20....	- 4	0	- 8	.....	29·64	29·50	29·41
"	" 21....	- 6	- 3	- 5	.. ..	29·35	29·30	29·29
"	" 22....	- 4	- 1	- 3	......	29·50	29·75	29·84
"	" 23...	-15	- 8	-15	......	30·00	30·00	30·02
"	" 24....	-20	-13	-30	......	30·00	30·02	30·07
"	" 25....	-13	- 6	-12	......	29·96	29·90	29·80
"	" 26....	- 7	- 3	-10	......	29·72	29·71	29·70
"	" 27....	-10	- 3	- 8	......	29·60	29·55	29·52
"	" 28....	10	18	18	.....	29·42	29·31	29·22
"	" 29....	28	30	15	.....	29·22	29·31	29·52
"	" 30....	-10	- 7	-17	......	29·90	30·00	30·23
"	" 31....	-25	-10	-15	.....	30·46	30·40	30·30
	1894.							
"	Jan. 1....	-20	-15	-20	.....	30·20	30·05	30·00
"	" 2....	-20	-18	-22	.....	29·90	29·92	29·95
"	" 3....	-25	-18	-20	.....	30·12	30·15	30·20
"	" 4....	-10	- 9	- 8	.....	29·90	29·75	29·62
"	" 5....	0	2	-15	...	29·50	29·60	29·70
"	" 6....	-15	-18	-20	......	29·90	29·80	29·90
"	" 7....	-30	-22	-25	......	29·90	29·78	29·96
"	" 8....	-35	-18	-26	.....	29·90	29·82	29·82
"	" 9....	-30	-10	-18	...	29·82	29·82	29·84
"	" 10....	-24	-15	-20	......	29·90	30·00	30·02
"	" 11....	-25	-17	-35	. . .	30·10	30·09	30·04

Labrador Peninsula, 1893-1894—*Continued.*

Wind.						Clouds.			Notes on weather during last 24 hours.
Direction.			Force.						
7	2	9	7	2	9	7	2	9	
N.	N.W.	W.	1	2	1	8 K	8 N	4 K	C. B., rain which soon turns to snow
W.	W.	W.	1	1	1	....	1 K	3 K	B.
N.W.	N.W.	......	1	1	..	6 K	8 K. S.	10 N	C. B., snow.
W.	N.W.	W.	1	1	2	1 K	8 K. S.	10 K	C. B.
N.W.	N.W.	W.	2	2	2	10 N	10 N	7 K	Snow, one foot of snow on ground.
W.	W.	W.	1	2	1	6 K	7 K	8 K	C. B.
N.W.	W.	W.	1	1	1	5 K	8 K. S.	2 K	C. B., Goose Bay frozen.
S.W.	S.W.	......	1	1	..	2 K	8 K	10 N	C. B., snow.
N.W.	N.W.	......	1	1	..	8 N	10 N	8 K	C. B., rain.
S.W.	S.W.	......	1	..	..	1 K	6 K	8 K.N.	B. C. C., ice floating in river.
N.W.	N.W.	N.	1	1	2	2 K	10 N	....	B., snow at noon.
W.	N.W.	N.W.	2	1	3	8 K	9 N	6 K. S.	Snow and squalls.
W.	W.	......	2	2	..	....	2 K	....	B., clear and calm.
S.W.	N.W.	N.W.	1	1	2	6 N	2 K	....	Snow in morning.
N.W.	N.W.	W.	2	2	1	3 K	2 K	1 K	C. B., aurora.
S.W.	W.	W.	1	1	1	4 K. C.	8 K. S.	10 N	C. B., snow, trout and smelt caught
S.W.	S.W.	......	1	1	..	5 K. S.	4 K	....	C. B., aurora, river frozen over.
W.	W.	W.	1	2	4	4 K. S.	....	2 K. S.	B. C., aurora.
S.W.	S.W.	W.	3	1	1	4 K. S.	10 N	....	C. B., snow at noon, aurora.
S.W.	S.W.	......	1	1	..	7 K	7 K. S.	1 K	C. B., river open.
N.W.	S.W.	S.W.	1	1	1	6 K	8 K	8 N	C. B., snow at night.
N.W.	W.	W.	1	1	3	10 N	3 K	....	Snow, C. B.
N.	N.W.	N.W.	2	1	3	10 S.	6 K	4 S.	C. B.
N.	W.	W.	2	3	1	5 K	4 K. S.	3 K	C. B., river half open and ice floating
W.	W.	W.	2	2	2	4 S.	6 K. S.	4 S+C	C. B., much drifting.
W.	W.	......	2	1	..	4 K. S.	3 K	6 K. S.	C. B.
......	N.E.	N.E.	..	2	2	6 K. S.	8 N	8 N	Snow.
S.W.	S.W.	W.	1	1	2	8 K	6 K	....	C. B.
S.W.	S.W.	W.	2	1	1	9 K	....	....	C. B., river open at rapid.
N.W.	N.W.	......	2	2	..	8 N	N	N	Snow.
W.	W.	W.	1	1	1	7 K	4 K	2 K. S.	C. B., river frozen.
W.	W.	N.W.	2	1	1	6 K	3 K. S.	2 K	C. B.
W.	W.	W.	2	2	2	2 K	1 K	1 K	B.
N.W.	S.W.	W.	1	1	1	4 K	2 S.	....	B.
W.	W.	W.	1	1	1	2 K	3 K	....	B.
W.	W.	W.	2	1	1	1 K	1 K	....	B., aurora.
W.	W.	W.	2	2	1	1 K	....	1 K	B., aurora.
S.	S.	S.	2	1	2	2 K	4 S.	7 N	C. B., snow, river open.
S.W.	S.W.	S.W.	1	1	1	8 N	8 N	9 N	Drifting, aurora.
W.	N.W.	W.	1	1	2	8 N	6 S.	....	C. B.
S.W.	S.W.	W.	1	1	2	3 K	5 K	....	C. B.
S.W.	S.W.	W.	2	1	2	7 N	4 N	....	B., at 9 p.m. aurora.
W.	W.	W.	2	3	2	3 K	....	....	B., brilliant aurora.
W.	W.	W.	2	1	1	2 K	....	1 K	B., brilliant aurora.
N.W.	N.W.	N.W.	1	1	1	6 K. S.	7 N	8 N	Snow.
N.W.	N.W.	N.W.	1	1	2	7 N	6 N	5 K	C. B., snow.
W.	W.	W.	2	3	2	2 K.	2 K. S.	....	B.
W.	S.W.	S.W.	1	2	1	....	2 K. S.	....	C.B.
W.	W.	W.	1	1	1	1 K	1 K	....	B.
......	W.	W.	..	1	1	6 K. S.	1 K	1 K	B.
W.	W.	W.	3	2	3	....	....	....	B.
W.	W.	W	1	1	1	....	....	....	B., brilliant aurora.

METEOROLOGICAL OBSERVATIONS in the

Place.	Date.	Thermometer.			Minimum.	Barometer.		
	1894.	7	2	9		7	2	9
		°	°	°				
Northwest River, Labrador	Jan. 12	–20	0	–10		29·70	29·70	29·70
″	″ 13	–10	16	10		29·65	29·55	29·60
″	″ 14	18	20	10		29·82	29·82	29·95
″	″ 15	–10	10	0		29·80	29·85	29·90
″	″ 16	– 2	2	–15		29·99	30·05	30·35
″	″ 17	–23	– 3	–10		30·62	30·60	30·60
Traverspin	″ 18	–10	17	30		30·30	......	30·50
	″ 19	30	11	0		30·50	......	30·48
Muskrat Falls	″ 20	0	8	– 3		30·72	......	30·82
″	″ 21	0	20	10		30·61	......	30·20
	″ 22	30	33	10		29·90	29·70	29·64
Gull Lake	″ 23	0	– 2	– 5		30·20	30·20	30·20
″	″ 24	0	5	0		30·25	30·30	30·50
″	″ 25	9	13	– 3		30·49	30·49	30·47
″	″ 26	–20	–12	–22		30·45	30·45	30·45
Muskrat Falls	″ 27	–20	– 5	–25		30·42	30·40	30·40
	″ 28	–32	0	18		30·44	30·52	30·58
	″ 29	20	– 3	–10		30·70	30·56	30·70
	″ 30	– 8	0	– 3		30·70	30·70	30·60
Northwest River	″ 31	2	5	0		30·60	30·50	30·48
″	Feb. 1	0	– 2	–10		30·30	30·25	30·20
″	″ 2	–20	–12	–20		30·10	30·12	30·11
″	″ 3	–10	0	– 6		30·05	28·98	29·80
″	″ 4	–12	0	–10		29·75	29·80	29·86
″	″ 5	–20	– 8	–23		30·20	30·18	30·15
″	″ 6	8	12	10		30·00	29·96	29·92
″	″ 7	20	22	– 8		29·80	29·92	30·00
″	″ 8	–10	0	–12		30·50	30·51	30·52
″	″ 9	– 8	4	–10		30·50	30·45	30 50
″	″ 10	–10	3	–10		30·56	30·50	30·30
″	″ 11	0	10	–10		30·10	30·08	30·09
″	″ 12	–30	–24	–24		30·20	30·10	30·42
″	″ 13	–30	–17	–20		30·40	30·30	30·30
″	″ 14	–17	0	– 3		30·22	30·08	30·10
″	″ 15	– 5	13	– 5		30·05	30·02	29·99
″	″ 16	– 0	5	– 5		29·42	29·60	29·72
″	″ 17	26	–15	–19		30·22	30·35	30·50
″	″ 18	–16	– 3	0		30·15	29·95	29·62
″	″ 19	6	8	– 8		29·95	30·15	30·35
″	″ 20	– 7	0	– 5		30·20	29·85	29·65
″	″ 21	–12	– 5	–13		29·96	30·07	30·15
″	″ 22	– 9	– 7	– 2		30·20	30·17	30·10
″	″ 23	– 8	8	0		30·08	29·92	29·92
″	″ 24	–24	–10	–26		30·00	30·08	30·08
″	″ 25	–30	– 8	–12		30·22	30·19	30·20
″	″ 26	–29	8	– 5		30·10	30·02	30·10
Rabbit Island	″ 27	–20	0	– 6		30·46	30·50	30·52
Traverspin	″ 28	–13	0	0		30·32	30·20	30 10
	Mar. 1	– 5	5	10		30·32	30·20	30·12
Muskrat Falls	″ 2	32	50	25		30·02	30·21	30·36
	″ 3	21	29	5		30·36	30·31	30·42
	″ 4	5	35	30		30·22	30·20	30·12
	″ 5	32	30	25		25·95	30·00	30·25
	″ 6	20	35	30		30·40	30·20	30·10

Labrador Peninsula, 1893-1894—*Continued.*

Wind.						Clouds.			Notes on weather during last 24 hours.
Direction.			Force.						
7	2	9	7	2	9	7	2	9	
W.	W.	W.	1	1	..	7 K.	10 K......	N......	C. B.
N.W.	N.W.	N.W.	1	1	1	8 N.	10 N......	4 K.....	Snow.
N.W.	N.W.	.....	1	1	..	8 N.	6 K. S...	....	C. B.
W.	W.	N.W.	1	2	2	2 K. S...	4 K. S...	6 K......	C. B.
N.W.	W.	W.	3	2	1	8 K......	4 K......	6 K. S....	C. B., heavy drift.
......	W.	W.	..	1	1	6 K......	2 K......	....	B.
W.	S.W.	S.W.	1	1	2	1 K......	9 K. S...	10 S	Soft, mild.
S.W.	W.	N.W.	1	3	3	8 S.+C..	9 S	....	Drift.
.....	N.	.....	..	1	..	....	....	6 K......	B.
W.	....	W.	2	..	1	7 K. N...	8 K......	8 S......	C. B.
S.	S.W.	W.	3	1	..	8 K. S...	8 K. S...	7 K. S...	B. C.
W.	N.W.	S.W.	3	2	2	6 K......	....	7 S......	B.
S.W.	W.	S.E.	2	2	1	3 K. S...	10 N......	9 N......	B., snow at night.
W.	W.	N.W.	1	2	2	10 N......	10 K. S...	10 N......	Snow.
N.W.	N.W.	N.	3	2	3	3 K......	....	....	B., aurora.
W.	W.	N.W.	2	1	1	8 S......	5 K......	6 K. S...	C. B.
N.W.	W.	N.W.	1	1	1	6 S......	3 K. S...	6 K. S...	C. B.
W.	N.W.	W.	2	2	1	....	....	2 K......	B., aurora.
W.	E.	N.	2	1	1	5 K. S...	9 S. K...	4 K......	B.
S.E.	......	S.W.	2	..	1	6 S	8 S. K...	....	C. B.
S.W.	S.W.	......	2	1	..	6 K. S...	3 K. S...	....	C. B., aurora.
S.W.	......	......	1	..	..	....	....	....	B., briillant aurora.
S.W.	.....	S.W.	2	..	1	3 K. S...	7 S.....	7 K. S...	C. B.
N.W.	N.W.	W.	2	2	2	8 K. N...	8 K. S. N.	9 K.....	Snow drift all day.
W.	W.	.....	2	1	..	2 K......	2 K......	....	B., aurora.
W.	W.	W.	1	2	2	....	8 S......	....	C. B.
S.W.	S.	S.W.	2	2	1	8 K......	10 K. C...	K......	Dull.
W.	W.	W.	2	1	2	3 S.....	3 C. ..	....	C. B.
......	......	W.	..	..	1	4 S. K...	3 S......	2 K......	B.
W.	W.	.....	1	1	..	3 K......	1 K......	....	B.
N.	N.	N.W.	1	2	4	6 K......	4 K. S...	....	C. B.
N.W.	N.W.	N.W.	5	3	3	3 K......	....	....	B.
N.W.	W.	W.	2	2	1	3 K. S...	7 K. S...	....	C. B.
S.W.	S.W.	S.W.	2	3	2	2 K. S...	6 K......	....	B.
W.	W.	W.	2	1	2	8 N......	6 K......	6 K.....	C. B.
N.E.	N.E.	N.E.	2	1	2	5 K......	....	....	B.
N.W.	N.	N.W.	2	2	1	10 N......	10 N.	10 N......	Snow.
N.W.	N.E.	N.E.	1	1	1	6 K. S...	4 K. S ..	....	C. B., drift.
N.W.	N.W.	W.	3	2	2	10 N......	10 N......	10 N......	Snow.
N.W.	.	N.W.	2	..	3	3 K......	10 N......	....	B. R., drift, at night aurora.
N.W.	W.	W.	3	2	2	2 K......	1 K......	3 S......	B. Dull.
W.	S.W.	S.W.	2	2	3	2 K......	2 K......	3 S. ...	B.
W.	N.E.	N.E.	1	1	2	3 K......	6 K. S...	10 N......	B. C., aurora.
N.	N.	N.W.	2	2	2	6 K......	4 K......	... .	B. C., drift.
N.W.	N.	W.	2	1	2	....	....	....	C. B., aurora.
W.	S.W.	W.	1	1	1	3 K......	7 K......	....	B. C.
W.	W.	W.	1	1	2	....	....	4 K. S...	C. B.
.....	S.	S.	..	2	2	6 K. S...	10 N......	8 K. S...	Drift and snow.
......	S.W.	S.	..	2	2	2 K......	3 K......	10 K......	C. B.
S.	S.	S.	2	2	2	7 K. S...	6 K. S...	2 K......	C. B.
W.	W.	W.	2	2	1	2 K......	1 K......	....	B.
S.	S.W.	S.W.	1	1	1	7 K. S...	6 K.+C..	5 S... ...	C. B.
S.	S.	E.	2	2	2	10 N......	6 S	....	Rain in a.m., C. B.
W.	E.	E.	2	2	2	2 K......	9 K.+C..	10 K......	O., rain and snow.

METEOROLOGICAL OBSERVATIONS in the

Place.	Date.	Thermometer.			Minimum.	Barometer.		
	1894.	7	2	9		7	2	9
		°	°	°				
....	Mar. 7....	25	28	20	.....	29·76	29·76	29·70
....	" 8....	10	20	5	.....	30·20	30·20	30·22
....	" 9....	0	10	0	.....	30·30	30·30	30·40
....	" 10....	- 3	15	25	.....	30·45	30·20	30·12
....	" 11....	29	40	40	.....	30·02	29·90	29·62
....	" 12....	35	31	31	.....	29·32	29·52	29·82
....	" 13....	1	......	0	.....	29·82	.....	29·92
....	" 14....	-12	.....	- 4	.....	30·05	......	29·85
....	" 15....	- 5	.....	0	.....	29·92	......	29·82
....	" 16....	10	......	0	.....	29·89	......	29·82
....	" 17....	12	20	20	.....	29·92	30·05	30·15
Minipi River........................	" 18....	0	20	5	.....	30·22	30 42	30·39
....	" 19....	-10	......	15	.....	30·25	......	29·94
....	" 20....	17	25	12	.....	30·08	30·10	30·25
....	" 21....	- 1	10	- 5	.....	30·35	30·30	30·05
....	" 22....	-18	5	- 2	.....	30·04	29·50	29·54
....	" 23....	-15	9	- 3	.....	29·74	29·68	29·58
....	" 24....	- 5	28	10	.....	29·55	29·44	29·52
....	" 25....	- 9	30	12	.....	29·66	29·47	29·34
....	" 26....	5	15	10	.....	29·34	29·20	28·84
....	" 27....	15	12	10	.....	28·44	28·57	28·70
Winokapau Lake......................	" 28....	- 5	10	2	.....	29·02	29·05	29·18
"	" 29....	- 8	25	25	.....	29·25	29·08	28·92
"	" 30....	10	28	0	.....	28·90	28·90	28·85
"	" 31....	-12	11	3	.....	29·05	29·06	29·09
"	April 1....	10	23	20	.....	28·70	28·36	28·35
"	" 2....	- 3	15	8	.....	28·60	28·54	28·72
"	" 3....	0	12	0	.....	29·00	29·02	29·18
"	" 4....	- 8	30	0	.....	29·46	29·36	29·42
"	" 5....	0	30	22	.....	29·42	29·32	29·42
"	" 6....	14	30	20	.....	29·45	29·42	29·40
"	" 7....	8	20	20	.....	29·60	29·62	29·65
"	" 8....	10	33	21	.....	29·85	29 82	29·95
"	" 9....	5	33	21	.....	29·95	29·45	29·92
"	" 10....	5	40	33	.....	29·92	29·80	29·84
"	" 11....	15	52	38	.....	29·76	29·74	29·76
"	" 12....	18	58	38	.....	29·92	29·86	29·85
"	" 13....	12	52	45	.....	29·82	29·62	29·62
"	" 14....	20	54	48	.....	29·60	29·50	29·52
"	" 15....	25	52	42	.....	29·58	29·62	29·48
"	" 16....	25	53	45	.....	29·56	29·50	29·56
Hamilton River, below Grand Falls..	" 17....	27	34	37	.....	29·83	29·77	29·72
" " ..	" 18....	33	45	38	.....	29·51	29·30	29·26
" " ..	" 19....	36	39	35	.....	29·30	29·45	29·45
" " ..	" 20....	30	40	38	.....	29·56	29·48	29·40
" " ..	" 21....	33	38	25	.....	29·26	29·16	29·45
" " ..	" 22....	20	41	40	.....	29·62	29·66	29·61
" " ..	" 23....	25	45	42	.....	29·56	29·22	29·14
" " ..	" 24....	31	31	26	.....	29·35	29·45	29·54
" " ..	" 25....	15	42	38	.....	29·50	29·24	29·22
" " ..	" 26....	26	47	39	.....	29·22	29·23	29·10
" " ..	" 27....	23	42	36	.....	29·35	29·26	29·42
" " ..	" 28....	14	26	18	.....	29·60	29·62	29·78
" " ..	" 29....	10	27	25	.....	29·86	29·92	29·94

Labrador Peninsula, 1893-1894—*Continued.*

Wind.						Clouds.			Notes on weather during last 24 hours.
Direction.			Force.						
7	2	9	7	2	9	7	2	9	
.....	E.	W.	..	2	2	10 C.....	10 N.....	8 K.....	Snow and rain.
W.	W.	W.	2	2	2	1 K.....	6 K.+C..	4 K. S...	C. B.
W.	W.	W.	1	1	1	....	6 K. S...	....	B.
W.	W.	W.	2	2	3	4 K.....	2 K.....	2 K.....	B.
S.W.	S.	S.	2	1	1	6 K.....	7 S.+C..	6 S.+C..	C. B.
S.	W.	W.	2	2	2	10 S. K..	....	....	B. C.
W.	W.	.....	1	2	..	....	3 K.....	....	B. B.
W.	.....	W.	1	..	2	....	....	6 K.....	B.
.....	.....	.....	..	..	..	7 K. S...	....	8 K. S...	C. B.
S.	...	S.	1	..	1	10 K. S...	....	7 K. S...	O. G.
S.	W.	.....	1	1	..	6 K.....	7 K. S...	4 K. S...	O. D.
W.	W.	W.	1	1	1	....	....	....	B. B. B., aurora.
W.	S.	W.	3	2	1	8 K. S...	....	8 N.....	C. B., snow.
W.	S.W.	W.	1	1	2	7 K. S...	4 K.....	....	C. C. B.
N.W.	N.W.	W.	3	2	1	....	....	....	B. B., aurora.
.....	N.W.	.....	..	3	..	3 K.....	....	....	B. B., aurora.
.....	W.	.....	..	1	..	....	2 C.....	2 K.....	B., hazy.
.....	.....	N.	..	..	1	2 K. S...	8 K.+C..	6 K.....	C. B.
.....	W.	.....	..	2	..	3 K.....	Mist.....	....	C. B., haze.
W.	S.	S.	1	1	2	....	8 N.....	10 N.....	Snow and rain.
N.	N.	N.	3	3	3	7 N.....	7 N.....	4 N.....	Drift and snow.
N.	N.	N.	3	3	3	4 K. S...	6 K.....	....	B. Dull.
W.	W.	S.W.	1	2	1	....	5 K.+C..	2 K.....	B. C.
W.	W.	W.	2	3	4	3 C.....	4 S.+C..	5 S.+C..	C., drift.
N.W.	N.W.	.....	4	4	..	3 K.....	4 K.....	....	B., brilliant aurora.
E.	E.	E.	2	3	2	10 N.....	10 N.....	10 N.....	Snow and rain.
N.W.	N.W.	N.W.	2	5	5	4 K.....	7 K.+C..	10 haze....	C. B.
N.W.	N.W.	N.W.	3	3	3	....	4 K.....	....	Drift and haze.
N.W.	W.	.....	3	2	..	4 K.+C..	3 K.....	4 K. S...	B.
E.	E.	S.	1	2	2	5 K.....	9 K.+C..	8 S. K...	O. Dull.
S.	E.	.....	2	2	..	10 K.S+C	3 S.....	....	C. B., aurora.
E.	E.	.....	1	2	..	....	4 S. K...	6 S. K...	B. B.
.....	S.E.	.....	..	2	..	7 K. S...	4 K.....	....	B., aurora.
W.	W.	W.	1	1	1	....	....	....	B. B. B.
.....	W.	W.	..	2	1	1 K.....	1 K.....	....	B. B.
W.	.....	S.	1	..	2	1 K.....	4 K.+C..	....	B. B.
.....	.....	.....	..	..	..	1 K.....	....	....	B. B.
.....	W.	E.	..	1	1	....	1 K.....	....	B. B.
.....	.....	.....	..	..	..	....	3 C.+K..	3 C.....	Aurora, B. B.
.....	S.	.....	..	2	..	4 K.....	4 K.+C..	8 K.+C..	B. C., haze at night.
.....	S.	.....	..	2	..	4 S	....	2 S.....	B. B.
N.E.	E.	.....	2	2	..	7 K. S...	4 K. S...	2 K.....	C. B.
E.	S.E.	.....	2	2	..	10 K.....	10 K.....	6 K. S...	O. Dull.
N.W.	N.W.	.....	2	1	..	5 K. S...	6 K. S...	4 K. S...	C. B.
.....	E.	E.	..	2	1	9 K. S...	9 K. S...	10 K. S...	O. Dull.
.....	.....	N.W.	..	..	3	10 N.....	10 N.....	4 K. S...	Snow and rain, at night clouds.
N.W.	.....	.....	2	..	..	6 K.....	....	3 K.....	B. C.
.....	S.E.	.....	..	1	..	1 K.....	10 N.....	10 N.....	Rain.
.....	S.E.	.....	..	2	..	8 N.....	8 K. S...	10 K. S...	C. B.
N.W.	S.W.	S.W.	3	2	1	3 K+C..	4 C.....	6 C.....	C. B.
E.	E.	S.	2	1	1	8 K.....	8 K+C..	10 N.....	C. B., rain.
N.W.	W.	S.W.	3	2	2	6 K+C..	1 K.....	10 K.....	C. B. O.
N.W.	N.W.	N.W.	2	2	2	....	7 K. S...	10 N.....	Snow, bald eagle seen.
N.W.	N.W.	W.	2	2	1	6 K. S...	3 K.....	2 K.....	B. C.

METEOROLOGICAL OBSERVATIONS in the

Place.	Date.	Thermometer.			Minimum.	Barometer.		
	1894.	7	2	9		7	2	9
		°	°	°				
Hamilton River, below Grand Falls..	April 30....	3	49	42	......	29·95	29·60	29·55
On tableland	May 1....	36	66	54	......	29·46	28·71	28·68
Grand Falls	" 2.. .	37	41	32	......	28·58	28·42	28·55
"	" 3....	21	33	29	...	28·76	28·82	28·82
"	" 4....	24	34	33	......	28·76	28·53	28·46
"	" 5....	32	34	28	....	28·52	28·45	28·72
"	" 6....	18	42	38	.....	28·72	28·70	28·55
Big Hill, Portage route.............	" 7....	31	37	32	......	28·46	28·22	28·01
"	" 8....	30	34	31	.....	27·87	27·95	28·03
"	" 9....	30	36	29	......	28·18	28·18	28·31
"	" 10....	30	38	25	.....	28·48	28·50	28·95
"	" 11....	22	48	41	......	28·87	28·52	28·52
"	" 12....	32	62	50	......	28·58	28·46	28·40
"	" 13 ...	48	32	30	......	28·25	28·36	28·46
"	" 14....	28	30	29	......	28·46	28·48	28·46
"	" 15....	30	37	32	.....	28·48	28·46	28·40
"	" 16....	35	37	35	... .	28·32	28·32	28·30
"	" 17....	36	52	46	.....	28·26	28·33	28·42
"	" 18....	30	58	44	.....	28·44	28·60	28·66
Grand Falls, Spring Camp..........	" 19....	39	49	46	...	28·74	28·83	28·92
"	" 20....	42	54	48	......	28·96	29·00	28·95
"	" 21....	46	44	36	.. ...	28·93	28·92	28·86
"	" 22....	35	44	35	......	28·88	28·82	28·63
"	" 23...	38	60	39	......	28·59	28·51	28·48
"	" 24....	35	58	40	......	28·50	28·48	28·52
"	" 25....	30	60	48	......	28·48	28·52	28·50
"	" 26....	30	65	45	... .	28·52	28·50	28·54
"	" 27....	44	54	43	......	28·50	28·54	28·54
"	" 28....	44	60	45	......	28·52	28·48	28·46
"	" 29....	38	54	44	... ..	28·50	28·45	28·56
"	" 30.. .	38	57	48	.... .	28·60	28·47	28·46
....	" 31....	40	58	48	......	28·48	28·48	28·49
Hamilton River, above Grand Falls..	June 1....	37	59	48	.....	28·50	28·40	28·36
" " ..	" 2....	48	56	52	......	28·30	28·13	28·13
" " . ..	" 3 ...	49	65	48	.....	28·08	28·04	27·94
" " ..	" 4....	45	65	47	......	27·88	27·83	27·83
" " ..	" 5....	46	40	35	....	27·76	27·92	28·05
" " ..	" 6....	37	45	37	......	28·10	28·14	28·24
....	" 7....	......	45	40	......	28·24	28·23	28·21
....	" 8....	31	54	46	......	28·24	28·10	28·04
....	" 9....	50	52	38	... .	28·05	28·12	28·22
....	" 10....	37	42	36	......	28·30	28·29	28·35
....	" 11....	35	42	34	......	28·35	28·50	28·52
....	" 12....	37	46	37	......	28·60	28·56	28·56
....	" 13....	37	......	.... .	.....	28·63	28·62	28·51
Sandy Lake.........................	" 14....	58	.....	50	....	28·42	28·50	28·32
"	" 15....	44	59	50	.....	28·30	28·24	28·02
....	" 16....	44	58	48	. ...	28·02	28·06	28·06
....	" 17....	52	60	44	.....	28·02	28·26	28·35
....	" 18....	42	......	.....	......	28·46	28·34	28·26

Labrador Peninsula, 1893-1894.—*Continued.*

Wind.						Clouds.			Notes on weather during last 24 hours.
Direction.			Force.						
7	2	9	7	2	9	7	2	9	
......	S.E.	E.	..	2	1	1 K	8 K. S...	6 K. S...	C. B., O. dull.
S.E.	......	......	1	..	..	10 K+C..	4 K	1 K	O. dull, B., thunder, black ducks seen.
......	......	......	..	..	..	7 K. S...	10 N	10 N	Rain and snow, a butterfly and several moths seen.
N.W.	W.	......	2	2	..	10 K. S...	4 K. S...	1 K	C. B. B., rose-breasted grosbeck seen.
S.	S.	S.W.	2	1	1	10 K. S...	10 N	10 S....	Snow and rain, Canada goose seen.
......	......	......	..	..	..	9 S.K ...	6 K. S...	1 S ...	Showers, C. B.
......	......	......	..	..	..	....	1 S......	3 S+C ..	C. B., haze.
S.	S.E.	S.E.	2	2	2	10 N	10 N	10 N	Rain and snow.
S.E.	......	S.E.	1	..	2	10 N	10 S+N ..	10 N	Snow and rain.
S.E.	E.	N.	2	2	2	10 N	10 N	10 N	Snow.
W.	W.	......	2	1	..	8 K. S...	2 K	2 K	C. B. B.
S.E.	S.E.	S.	2	2	1	10 K. S...	10 S......	10 S+C ..	C. B., showers.
S.W.	S.E.	......	2	1	..	7 S. K...	4 K	10 S......	O. dull, showers ; robins seen.
......	N.W.	W.	..	2	2	10 N	10 N	10 S	Snow.
N.W.	N.W.	N.W.	2	2	3	10 N	10 N	10 N	Snow, a black bear and gray geese seen.
N.W.	N.E.	N.	3	2	2	10 S......	10 S......	10 N	O. dull, snow. [seen.
N.	N.	N.	2	2	1	10 N	7 S.N ...	10 S......	C. B., snow and rain ; rusty grackle
......	N.W.	......	..	1	..	10 N	10 N	7 K	Snow and rain.
......	E.	......	..	1	..	3 S......	5 K. S...	7 K+C..	C. B., gulls seen.
S.E.	S.E.	E.	1	2	2	10 K+C..	7 K. S...	8 S ...	C. O. dull.
E.	S.E.	S.	2	2	2	10 S......	7 S......	10 S.....	C. B.
S.	W.	W.	1	1	1	10 N	8 S.....	10 S	Rain, C. B.
......	W.	W.	..	1	1	7 S.. ..	6 S......	2 K	C. B.
.....	W.	N.W.	..	2	1	... .	....	....	B. B. B.
N.W.	W.	W.	1	1	1	1 K	....	1 K	B. B., mosquitoes in numbers.
......	S.	.....	..	1	..	2 K	1 K	2 K	B. B., swallows seen.
..	S.E.	S.E.	..	1	1	....	3 K	3 S.....	B. B.
S.W.	W.	W.	1	1	1	2 S......	3 K	2 K	B. B.
.....	......	S.W.	..	..	..	10 K. S...	2 K	1 K	C. B.
N.E.	N.E.	......	1	1	..	6 K. S...	5 K. S...	4 K. S...	C. B., ice formed last night.
......	S.	S.	..	1	1	3 K. S...	10 K. S...	7 K. S...	C. B., ice formed last night.
S.E.	S.E.	......	1	2	..	8 K. S...	6 S......	7 K. S...	C. B.
......	......	S.W.	..	..	1	2 K. S...	5 K. S...	7 K+C..	B. C.
S.W.	S.W.	S.W.	2	1	1	10 N	6 S......	7 S.. .	Rain, C. B.
......	.....	.....	..	..	..	9 S.....	6 S.....	7 K. S...	C. B. [shower.
......	S.W.	....	..	2	..	1 K	7 S......	7 S+C ..	C. B., ice formed last night ; thunder
N.	N.	N.	1	2	2	10 S	10 N	10 N	C. C., rain and snow.
N.	N.	....	2	2	..	10 N	10 N	9 S......	C. B., severe snow storm.
S.W.	S.W.	S.W.	1	2	1	10 N	7 S......	8 K. S...	Rain, C. B., robin's nest found having fœtus well developed and partly feathered.
S.	S.	S.W.	1	2	1	7 K. S...	3 S.....	....	B., ice formed.
S.	S.	N.	2	2	2	10 S.....	6 K	4 S......	C. B., Viola canina in bloom.
N.	N.W.	N.W.	3	2	2	7 S......	5 K. S...	7 K. S...	B. C., snow ; partridge nest eggs partly hatched. [hatched.
N.	N.	.....	3	3	..	10 K. S ..	7 K. S...	8 K+C..	C., snow and hail ; young woodpecker
......	N.W.	......	..	2	..	10 K+C..	10 S......	2 S......	C. B., Osprey's eggs found.
.....	N.W.	N.W.	..	3	1	10 S	7 S......	4 S......	C. B. [some places.
W.	S.W.	S.W.	2	3	1	6 S+C ..	3 S......	8 C+K..	C. B., unbroken ice still in lakes in
.....	N.E.	.....	..	2	..	4 K. S...	6 C+K..	8 C+S ..	C. B., slight frost last night.
S.	E.	E.	2	2	1	7 S+C ..	10 haze...	10 S+C ..	O. dull, showers.
S.W.	S.W.	S.W.	1	2	1	10 S.. .	6 K. S...	6 K	C. B., showers.
S.	S.	... ..	2	2	..	2 S......	2 K. S...	7 C+S ..	C. B., thermometer broken.

METEOROLOGICAL OBSERVATIONS in the

Place.	Date.	Thermometer.			Minimum.	Barometer.		
	1894.	7	2	9		7	2	9
	June 19					28·27	28·30	28·31
	" 20					28·34	28·32	28·31
	" 21					28·34	28·32	28·26
Dyke Lake	" 22					27·94	28·05	28·24
	" 23					28·45	28·44	28·45
Petitsikapau Lake	" 24					28·55	28·52	28·25
"	" 25					27·90	27·82	27·89
"	" 26					27·82	28·08	27·95
"	" 27					27·92	28·05	28·10
"	" 28					28·45	28·52	28·54
"	" 29					28·62	28·64	28·42
"	" 30					28·35	28·32	28·35
"	July 1					28·46	28·45	28·42
"	" 2					28·35	28·26	28·16
	" 3					28·12	28·15	28·05
Ashuanipi Branch	" 4					27·82	27·76	27·78
"	" 5					27·78	27·72	27·78
"	" 6					27·72	27·92	27·92
"	" 7					28·16	28·16	28·16
	" 8					28·26	28·29	28·32
	" 9					28·40	28·42	28 39
Highest point reached on Hamilton River on Ashuanipi Branch	" 10					28·45	28·42	28·37
	" 11					28·34	28·24	28·12
	" 12					28·02	27·92	27·76
	" 13					27·76	27·77	27·82
	" 14					27·82	27·95	28·04
	" 15					28·08	28·14	28·24
	" 16					28·26	28·27	28·26
Sandy Lake	" 17					28·32	28·34	28·32
	" 18					28·34	28·32	28·30
	" 19					28·30	28·32	28·22
	" 20					28·02	28·02	28·03
Michikaman Lake	" 21					28·32	28·40	28·32
"	" 22					28·22	28·12	28·23
"	" 23					28 40	28·42	28·44
"	" 24					28·36	28·32	28·32
"	" 25					28·15	28·12	28·14
"	" 26					28·24	28·32	28·41
	" 27					28·52	28·46	28·42
	" 28					28·26	28·12	28·12
	" 29					28·15	28·12	28·19
Sandy Lake	" 30					28·22	28·24	28·03
"	" 31					28·04	28·04	28·06
"	Aug. 1					28·05	28·20	28·32
"	" 2					28·30	28·36	28·38
Osokmanowan Lake	" 3					28·44	28·42	28·32
"	" 4					28·18	28·02	27·96
"	" 5					27·92	28·02	28·14
"	" 6					28·12	28·04	28·12
Attiomiskonak Lake	" 7					28·14	28·14	28·00
"	" 8					28·02	28·04	28·06
"	" 9					28·21	28·25	28·25
Romaine River	" 10					28·26	28·26	28·32

Labrador Peninsula, 1893-1894.—*Continued.*

Wind. Direction. 7	2	9	Force. 7	2	9	Clouds. 7	2	9	Notes on weather during last 24 hours.
S.W.	S.W.	S.W.	2	2	2	6 K. S.	4 K. S.	10 K+C	B. C.
N.W.	......	N.W.	2	..	2	4 C+K	7 K. S.	3 K	C. B.
......	......	......	..	..	..	3 K. S.	4 S.	10 N	C. B., rain.
....	W.	N.W.	..	2	2	10 S.	10 N	10 N	Rain, thunder and lightning.
N.W.	N.	......	3	2	..	10 S.	3 K. S.	2 K. S.	O. dull, C. B.
N.W.	N.W.	N.	1	1	1	1 K	3 S+C	6 S+C	B. B., ice formed last night.
N.W.	E.	N.W.	1	1	2	10 N	10 Ks.	6 K. S.	Rain, C. B.
N.W.	S.	......	2	2	..	10 K. S.	8 K.S+C	10 N	Rain.
N.W.	N.W.	N.W.	2	2	3	10 N	10 K. S.	7 K. S.	Rain, O. dull. [7 a.m.
N.W.	...	......	2	..	..	10 K. S.	7 K. S.	8 K. S.	C. B., ice formed, a flurry of snow at
....	......	N.E.	..	..	1	1 K. S.	1 K	2 K	B., ice formed last night.
E.	S.	S.	3	2	2	10 S	9 S.	4 K. S.	O. dull.
E.	....	......	1	..	..	10 S.	10 K. S.	4 K. S.	C. B.
S.E.	S.	......	2	2	..	10 S.	10 S.	10 N	O. dull, rain.
S.	S.	......	1	2	..	7 K. S.	7 K. S.	10 S.	C. B.
S.W.	S.W.	......	1	2	..	10 S.	10 K. S.	7 S+C	C. B., passing showers.
S.W.	W.	S.W.	2	2	2	10 S.	10 S.	7 K. S.	C. B., passing showers.
S.W.	S.W.	......	2	2	..	10 K. S	10 S.	8 K.S+C	C. B., passing showers.
S.E.	......	E.	2	..	1	6 K. S.	4 S.	8 K. S.	B.
E.	E.	E.	1	1	1	10 N	8 K.S	10 S.	C. B.
....	E.	......	..	1	..	10 S.	10 S+K	7 S.	C. B., showers.
....	......	......	..	..	..	10 S+K.	8 S.	10 S.	C. B., thunder shower.
S.	S.	S.	1	2	2	10 K. S.	10 K. S.	7 S.	C. B., showers.
N.	N.	....	1	2	..	10 K. S.	6 S	8 K. S.	C. B., showers.
N.W.	N.W.	N.W.	2	2	2	8 K. S.	7 S.	7 S.	C. B., showers.
N.W.	N.W.	...	2	2	..	8 K. S.	6 S.	10 N	C. B., rain.
N.W.	N.W.	......	2	2	..	10 N	10 S.	7 S	C. B., rain.
N.W.	N.W.	......	2	2	..	6 S.	6 S.	2 S.	C. B., hail and showers.
......	N.W.	N.W.	..	2	1	1 S.	6 S.	......	C. B.
......	......	......	..	..	..	3 K	2 S. K	5 S	B. C., thunder showers.
......	W.	W.	..	2	2	10 S	6 S.	8 K. S.	Fog, C. B. [night.
W.	W.	W.	2	3	2	10 N	6 K. S.	8 N	C. B., showers at intervals during
N.W.	N.W.	...	2	2	..	10 S.	3 Ks.	7 K. S.	C. B.
S.	S.	W.	2	2	2	3 K. S.	10 K. S.	10 N	C. B., rain.
N.W.	N.W.	......	3	3	..	6 K. S.	3 K. S.	6 N	C. B., rain. [mage
S.W.	S.W.	S.W.	2	3	3	7 K. S.	4 K. S.	6 K. S.	C. B., ptarmigan in full summer plu-
S.	S.	S.W.	2	2	2	10 N	10 N	10 N	Steady rain.
N.W.	N.W.	N.W.	2	3	2	7 K. S.	10 N	3 K	Showers.
N.W.	N.W.	......	1	2	..	2 K. S.	4 K. S.	3 K. S.	B., heavy frost last night.
E.	E.	......	1	1	..	6 K. S.	10 N.	8 K. S. + C	C. B., rain, showers.
E.	E.	......	3	2	..	7 S.	10 N.	8 N.	C. B., rain.
E.	E.	N.E.	1	2	3	10 N.	10 S.	10 N.	R. R., heavy showers.
S.W.	S.W.	S.W.	2	2	2	10 S.	10 S.	9 S	C. C., showers.
S.W.	S.W.	N.W.	2	2	1	10 N.	10 K. S.	6 K. S.	C. R. R., heavy rain.
N.W.	N.W.	......	2	2	..	10 N.	9 K. S.	9 S.	Rain, C.
......	S.	N.W.	..	2	1	......	5 S. K.	10 K. S.	C. C.
......	S.W.	S.W.	..	1	2	10 K. S.	10 N.	9 S.	Rain.
N.W.	N.W.	N.W.	2	2	2	10 S.	9 K. S.	7 S.	C. C., showers. [ning.
W.	S.	......	1	2	..	10 S.	10 K.	10 S.	Mist, much rain, thunder and light-
......	S.W.	S.W.	..	2	2	1 K.	10 S.	10 S.	C., gales, rain, thunder and lightning.
N.W.	S.W.	S.W.	2	2	2	5 K.	10 S.	10 S	C., rain.
W.	N.W.	......	2	2	..	10 K. S.	8 S.	10 S.	C. C.
......	N.	N.W.	..	2	2	10 K. S.	10 K. S.	7 K. S.	C. B., ice formed.

METEOROLOGICAL OBSERVATIONS in the

Place.	Date.	Thermometer.			Minimum.	Barometer.		
	1894.	7	2	9		7	2	9
Romaine River	Aug. 11					28·36	28·34	28·37
"	" 12					28·42	28·48	28·44
"	" 13					28·42	28·47	28·52
"	" 14					28·52	28·55	28·54
"	" 15					28·52	28·46	28·42
"	" 16					28·36	28·18	28·19
"	" 17					28·26	28·25	28·42
"	" 18					28·40	27·98	27·78
"	" 19					27·78	28·08	28·12
St. John River	" 20					28·15	28·20	28·94
St. John Village	" 21					28·94	29·35	29·55
"	" 22					29·55	29·62	29·84
Mingan	" 23					29·84	29·80	29·70
"	" 24					29·75	29·86	29·83

Labrador Peninsula, 1893–1894—*Continued.*

Wind.						Clouds.			Notes on weather during last 24 hours.
Direction.			Force.						
7	2	9	7	2	9	7	2	9	
......	N.	N.	..	2	1	4 S......	2 S	3 S......	B.
....	N.W.	......	..	1	..	1 S......	2 K.	2 K.	B. B.
S.	S.	S.	2	2	2	3 S	2 S ...	7 S......	C. B.
S.	S.	....	3	3	..	6 K. S...	7 K. S...	10 N.	C. B., showers.
S.	S.	S.	1	1	1	10 N.	10 N.	10 N.	Rain.
S.	S.	N.E.	1	1	1	10 N.	10 N.	10 N. . ..	Steady rain.
.....	......	......	..	..	..	10 S.....	9 S......	2 K	C. C. to C. B.
......	W.	N.W.	..	2	1	10 K.	3 K. S...	2 K.	C. B.
W.	W.	.. ..	2	1	..	10 N.	7 S......	3 S......	C., rain.
N.	N.	....	2	1	..	4 C.+S .	10 N.	10 S......	C., rain, C.
......	N.	N.	..	2	1	10 S......	5 S	7 S.. ..	C. to C. B.
......	...	...	..	..	..	7 S......	5 S......	8 S.....	C. B.
S.	S.E.	W.	1	1	1	5 K. S...	8 K. S...	10 N.	C. B., rain.
W.	W.	W.	1	2	2	10 K.	7 K.	2 K.	C. B., showers.

APPEN

METEOROLOGICAL OBSERVATIONS in the

Place.	Date.	Thermometer.			Minimum.	Barometer.		
	1895.	7	2	9		7	2	9
		°	°	°				
River St. Lawrence at mouth of Manicuagan River	July 1	......	65	53	43	30·00	29·95	29·95
" " "	" 2	53	69	64	42	30·09	30·22	29·94
Manicuagan River	" 3	52	80	69	50	29·95	29·96	29·87
"	" 4	60	80	70	59	29·96	29·92	29·78
"	" 5	54	95	72	......	29·79	29·74	29·64
"	" 6	60	75	75	......	29·65	29·62	29·52
"	" 7	65	85	65	64	29·47	29·42	29·31
"	" 8	62	88	67	55	29·42	29·32	29·32
"	" 9	60	85	68	......	29·32	29·32	29·29
"	" 10	52	65	50	46	29·49	29·49	29·49
Manicuagan Lake	" 11	38	80	60	32	29·56	29·92	29·85
Lake Mouchalagan	" 12	50	68	62	49	29·90	29·84	29·65
"	" 13	59	60	60	56	29·64	29·75	29·76
"	" 14	53	71	59	......	29·86	29·86	29·85
"	" 15	53	80	60	43	29 89	29·75	29·70
Upper Manicuagan River	" 16	65	80	58	60	29·71	29·71	29·66
"	" 17	59	74	56	55	29·65	29·51	29·46
"	" 18	55	65	51	......	29·29	29·35	29·44
"	" 19	50	60	48	45	29·61	29·60	29·62
Cache at foot of portage route	" 20	48	60	55	35	29·60	29·55	29·55
"	" 21	60	65	60	......	29·60	29·60	29·55
Portage route	" 22	52	65	50	46	29·54	28·80	28·75
"	" 23	55	65	62	50	28·76	28·50	28·45
"	" 24	60	68	52	50	28·46	28·48	28 48
"	" 25	50	65	50	40	28·39	28·06	27·94
"	" 26	55	67	40	48	27·95	27·92	27·84
"	" 27	40	65	40	33	27·72	27·86	27·86
"	" 28	50	60	48	40	27·84	27·80	27·80
"	" 29	48	58	52	45	27·69	27·70	27·86
"	" 30	48	60	45	32	27·90	27·92	27·94
"	" 31	48	65	52	45	27·92	27·94	27·96
"	Aug. 1	48	65	48	42	27·94	27·97	28·06
"	" 2	48	60	50	45	28·10	28·10	28·16
"	" 3	45	62	51	35	28·24	28·26	28·30
Attikopi Lake	" 4	55	65	60	45	28·30	28·30	28·35
"	" 5	50	65	56	50	28·32	28·32	28·36
Little Attikopi Lake	" 6	45	77	57	40	28·40	28·38	28·46
"	" 7	53	60	57	50	28·46	28·42	28·20
Height of Land, Nichicun River	" 8	57	60	55	56	28·05	28·00	27·98
Naokokan Lake	" 9	55	57	50	52	28·14	28·30	28·42
"	" 10	45	72	42	42	28·46	28·36	28·46
Little Attikopi Lake	" 11	45	65	62	42	28·42	28·42	28·35
"	" 12	52	60	52	52	28·35	28·32	28·11
River above	" 13	52	60	55	52	28·04	28·04	28·11
Watershed Lake	" 14	53	60	52	49	28·14	28·14	28·24
"	" 15	52	60	50	48	28·26	28·28	28·24
Manicuagan River below Watershed Lake	" 16	48	54	40	42	28·30	28·32	28·35
" " "	" 17	40	65	50	32	28·30	28·26	28·26
" " "	" 18	54	60	51	52	28·05	28·10	28·10
" " "	" 19	49	55	38	42	28·08	28·24	28·30

DIX VII.

Labrador Peninsula, 1895.

Wind. Direction. 7	2	9	Force. 7	2	9	Clouds. 7	2	9	Weather. 7	2	9	Remarks.
...	N.E.	...	..	2	..	...	6 N	...	...	R.	B	Passing showers.
...	N.	...	..	3	..	2 K	3 S.	2 S.	B	B	B	
...	W.	W.	..	2	2	3 K	10 H	3 K	B	B	B	
W.	W.	W.	1	2	1	H	H	4 K	B	B	B	
W.	W.	S.	1	1	2	...	3 K	7 K	B	B	C.B.	
S.	S.	...	2	2	..	6 H	4 H	3 K	H	B	B	
S.	S.	...	2	2	..	4 K. S.	6 K	4 K	B	B	B	
...	...	...	..	..	..	10 N	4 K	4 K	R.	B	B	
...	S.	S.	..	2	2	10 K. S.	10 N	7 S.	C. B.	R	C. B.	
N.W.	N.W.	N.W.	3	3	2	7 S.	6 S.	8 K.S.	C. B.	C. B.	C. B.	
W.	W.	W.	1	2	1	...	8 K.S.	10 K.S.	B. B.	C. B.	C. B.	Rain in passing showers.
W.	S.	...	1	2	..	1 K	7 K.S.	8 S.	B	C. B.	C. B.	
...	S.	S.	..	2	1	10 K	10 N.S.	7 K.S.	C. B.	C. B.	C. B.	
S.	S.E.	...	1	2	..	6 K	10 K.S.	7 S.	B	C. B.	C. B.	
...	S.	S.	..	2	1	10 H	3 K	10 S.	C. B.	B	C. B.	
S.	S.E.	S.	1	1	1	4 S.	2 S.	4 S.	C. B.	B	C. B.	Showers.
S.	S.	S.	2	2	2	6 K. S.	8 K.S.	10 K.S.	C. B.	C. B.	C. B.	"
S.	N.	N.	1	1	1	10 N	7 S.	10 S.	C. B.	C. B.	C. B.	"
N.	N.	N.	1	2	1	7 S	7 K.S.	8 K.S.	C. B.	C. B.	B	
N.	N.	S.	1	2	2	10 K. S.	10 S.	10 S.	C. B.	C. B.	C. B.	
...	S.W.	...	..	2	..	4 S.	4 S.	5 S.	B	B	C. B.	
...	S.	...	..	2	..	3 S	7 S.	10 N	B	C.B.	R.	Thunder; heavy rain.
...	N.W.	N.W.	..	2	2	8 S.	10 S.	7 K.S.	C. B.	C. B.	C. B.	Showers and heavy rain.
...	N.W.	N.W.	..	2	1	...	10 K.S.	7 S.	C. B.	C.B.R	R.	
...	N.W.	N.W.	..	2	1	10 K	7 K.S.	8 K.S.	C. B.	C. B.	C. B.	
S.	S.	S.	1	1	2	10 K. S.	7 S.	7 K.S.	C. B.	C. B.	C. B.	Passing showers.
S.	S.	S.	2	2	2	8 K	8 K.S.	10 K.S.	C. B.	C. B.	C. B.	Rain.
...	S.W.	...	..	2	..	10 N	10 S.	8 K	R. R.	C. B.	C. B.	Heavy rain.
N.	N.	N.	2	2	1	10 N	10 N	10 N	R.	R.	R. C.	Rain.
...	E.	E.	..	1	2	10 H	10 K.S.	10 N	C. B.	C. B.	C. B.	"
E.	E.	W.	2	2	2	10 N	10 N	6 K.S.	C. B.	R.	R.	"
W.	W.	W.	2	1	2	9 H	8 K.S.	7 K.S.	D. H.	C. B.	C. B.	Heavy showers.
E.	E.	...	2	2	..	10 K. S.	10 K.S.	5 S.	D. H.	C. B.	R	Showers passing.
...	N.W.	N.W.	..	2	1	7 S.	8 N	4 S.	B. C.	S.	C. B.	"
S.E.	S.E.	S.E.	1	2	2	8 S.	7 N	4 K	C. B.	R.	C. B.	"
...	S.E.	S.E.	..	2	2	10 H	10 K.S.	7 S.	C. B	R.	C. B.	"
...	W.	N.E.	..	2	2	10 H	6 S.K.	7 K.S.	C. B.	B	C. B.	
N.E.	N.	N.	1	1	2	8 K. S.	10 N	10 N	C. B.	C. B.	R.	"
N.	S.W.	S.W.	2	2	2	10 N	10 N	10 S.	R.	R.	C. B.	"
S.W.	S.W.	W.	1	2	2	10 K. S.	10 K.S.	10 K.S.	C	C	C. B.	"
...	S.W.	...	..	2	..	10 K. S.	7 K	10 K.S.	C	C	C. B.	"
S.W.	...	S.W.	2	..	2	7 K. S.	4 K.S.	8 K.S.	C	C	C	"
S.	S.	S.	2	2	2	10 N	10 K.S.	10 K.S.	R.	C. B.	R.	"
...	...	...	..	..	..	10 N	7 N	8 N	R.	R.	R.	Heavy showers.
...	S.	N.W.	..	2	1	10 N	10 N	6 K.S.	R.	R.	C	Heavy showers passing.
S.	S.	...	2	2	..	7 S.	7 K.S.	...	C	C	C. B.	Showers.
...	S.	...	..	2	..	10 K	10 K.S.	4 K	C	C	C	"
...	N.W.	N.W.	..	2	2	6 K	6 S.	7 S.	F	R. R.	C. B.	[and lightning
...	S.W.	S.W.	..	1	2	10 N	7 K.S.	7 K.S.	R. R.	C	C	Heavy rain; thunder
S.W.	S.W.	W.	2	2	3	10 K. S.	7 K.S.	4 S.	C	C	C. B.	Showers.

METEOROLOGICAL OBSERVATIONS in the

Place.	Date.	Thermometer.			Minimum.	Barometer.		
	1895.	7	2	9		7	2	9
		°	°	°				
Manicuagan River below Watershed Lake	Aug. 20	40	50	41	32	28·29	28·24	28·25
" " "	" 21	40	54	43	37	28·34	28·42	28·64
" " "	" 22	36	51	45	32	28·70	28·83	28·96
" " "	" 23	50	54	50	......	28·70	28·65	28·75
" " "	" 24	50	65	55	......	28·86	28·94	29·00
Cache at foot of Portage route	" 25	45	65	45	......	28·96	29·24	29·24
......	" 26	40	65	40	35	29·35	29·24	29·62
Mouchalagan Lake	" 27	34	60	48	31	29·68	29·62	29·35
"	" 28	45	55	45	....	29·15	29·35	29·46
......	" 29	38	62	40	34	29·59	29·72	29·76
......	" 30	40	65	58	35	29·82	30·28	30·42
Aux Outardes River	" 31	50	60	50	48	30·28	29·95	29·85
River St. Lawrence at mouth of Aux Outardes River	Sept. 1	51	60	52	.. ..	29·95	30·43	30·43
" " "	" 2	48	......	....	......	30·50	......	......

Labrador Peninsula, 1895—*Continued.*

Wind.						Clouds.			Weather.			Remarks.
Direction.			Force.									
7	2	9	7	2	9	7	2	9	7	2	9	
W.	W.	W.	2	3	3	3 S	10 N	7 S	C	R	R	Showers.
W.	W.	......	2	2	..	8 K. S	10 K.S.	7 S	C. B.	C. B.	C. B.	Passing showers.
N.W.	N.W.	N.W.	2	2	2	6 K. S	7 K	6 K	C. B.	C. B.	C. B.	"
W.	W.	.....	2	2	..	10 N	10 N	10 K.S.	R	R	C. B.	"
W.	W.	.....	2	2	..	8 K. S	6 K.S.	7 K.S.	C. B.	C	C	"
W.	W.	W.	2	2	2	8 K. S	10 N	7 N	C. B.	R. R.	R. L.	"
.....	W.	.....	..	2	..	6 K. S	10 N	6 K	C. B.	R	C. B.	"
.....	S.	S.	..	2	3	10 K	7 K	10 N	F	C. B.	R. R.	"
S.W.	S.W.	S.W.	2	3	2	10 N	7 K.S.	4 C	R	C. B.	C. B.	"
S.W.	......	....	2	..	..	7 C	10 K	1 K	C. B.	C	B	
......	S.	S.	..	3	2	7 K	6 S	4 K.S.	C. B.	R	C. B.	"
S.	S.W.	S.W.	3	3	1	10 K. S	6 C	10 N	C. B.	C. B.	R. R.	"
S.W.	S.W.	S.W.	2	3	2	7 K. S	6 K.S.	3 K.S.	C. B.	C. B.	C. B.	"
S.W.	..	.....	2	..	..	4 K.S. + C	.....	....	C. B.	.....	.....	